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The Impact of Prior Abortion on Anxiety and Depression Symptoms During a Subsequent Pregnancy: Data From a Population-Based Cohort Study in China

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ABSTRACT:

The impact of prior abortion on anxiety and depression symptoms during a subsequent pregnancy: data from a population-based cohort study in China

Objective: The aim of the study was to assess anxiety and depression in women with history of spontaneous abortion or induced abortion during a subsequent pregnancy.

Methods: The data were consecutively obtained from seven maternal and child health (MCH) Centers in the Anhui Province of China. The sociodemographic characteristics of the women, the number of previous pregnancies, number of living children, and gestational age of the current pregnancy were ascertained at the time of the interview.

Results: The pregnant women who were in the first trimester of their pregnancy reported significantly higher scores than those in the second trimester both on SAS (Zung's Self-Rating Anxiety Scale) and CES-D (The Center for Epidemiologic Studies-Depression Scale) (SAS score means: 32.11 vs 31.68, P=0.000; CES-D score means: 4.59 vs 4.06, P=0.012). The women with a history of induced abortions were significantly more likely to report more "cases" of depression (OR = 1.543, 95% CI = 1.055- 254) and more "cases" of anxiety (OR = 2.142, 95% CI = 1.294-3.561) during the first trimester than those with no history of abortion. Controlling for confounding variables yielded similar results. However, "cases" of depression and "cases" of anxiety were equally common in women with history of spontaneous abortions and in those with no abortion history.

Conclusions: These results suggest women who have experienced a previous induced abortion have omnipresent anxiety and depression symptoms during a subsequent pregnancy, especially during the first trimester.

Key words: Anxiety, depression, induced abortion, spontaneous abortion, pregnant women

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INTRODUCTION

Early pregnancy failure is the most common complication of pregnancy worldwide and in recent decades abortion has received considerable attention.Its legality and availability have often generated controversy. An estimated 7,215,400 abortions occur per year in China; the rate has declined by 21% from 1996 to 2003, but remains higher than rates in many Asian countries (1). A study conducted in rural areas of Shanxi province found that the ratio between spontaneous abortion and pregnancies was 12.0% (2). Abortion represents a complex biological and psychological event, which is regarded as a difficult and distressing life event for a woman. For many women, abortion may represent the loss of a future child, of motherhood, and of part of self, and it may engender doubts regarding the ability to procreate (3). Some studies have reported a statistical correlation between abortion and clinical depression and anxiety (4,5).

The majority of women, who suffer a loss of pregnancy, become pregnant again, an event that usually occurs within 18 months. The parental responses to the loss can extend to a subsequent pregnancy. Parents may begin to question their ability to maintain a pregnancy and successfully carry a child during the timeframe following a loss (6). Several investigators have recognized the importance of understanding the impact of prior perinatal loss on the subsequent pregnancy. In a review article, Geller stated that women with a history of pregnancy loss showed higher levels of anxiety during their subsequent pregnancy than women without prior loss (7). A study conducted in Berlin, Germany indicated that, compared to women without spontaneous abortions, women with prior spontaneous abortion had higher levels of pregnancy-related fear and state anxiety during the first trimester (8). A recent study by Cote-Arsenault

demonstrated that anxiety decreased as the pregnancy advanced (9). In line with this study, another study showed that for women with a history of early pregnancy loss, subsequent pregnancy anxiety was higher in early pregnancy versus late pregnancy (10). The impact of the previous perinatal loss was moderately correlated with depressive symptoms (11). Another study indicated that early pregnancy loss was predictive of more marked depression symptoms in the first trimester of a subsequent pregnancy (12). Regardless of the obstetric record, high levels of anxiety and depression ranging from clinically relevant symptoms to panic attacks may have harmful effects on the course and outcome of the pregnancy. A recent review concluded that elevated levels of depression and anxiety were found to be associated with obstetric outcomes (obstetric complications, pregnancy symptoms, preterm labor, and pain relief under labor), and had implications for fetal and neonatal well-being and behavior (13).

Prior abortion poses serious mental health risks for women, which further increase the risk of obstetric complications, pregnancy symptoms, and adverse pregnant outcomes. Therefore, exploring the type and magnitude of the impact of previous abortions on pregnant women's mental health has significant implications for determining high-risk groups and preventing psychological disease and adverse pregnancy outcomes. In this study, we propose a hypothesis that there is a difference between induced abortion and spontaneous abortion in terms of impact on pregnant women's mental health. The aim of this paper was to compare the symptoms of depression and anxiety during a subsequent pregnancy after spontaneous abortion with that of induced abortion. Meanwhile, the time after loss was included in the analyses to examine the impact of spontaneous abortion or induced abortion after different time intervals on a subsequent pregnancy .

METHODS

The ABCD cohort study (Anhui Birth Defects and Child Development Cohort Study) is an on-going prospective cohort study in Anhui, China from October 2008 for the prospective study of prenatal environmental exposure associated birth defects and child development. Women who receive prenatal care at the maternal and child health (MCH) Centers were eligible for inclusion in the cohort. After providing written informed consent, data on social demographic characteristics, occupational experience, and chemical exposure including drugs and life styles were collected by a questionnaire given to pregnant women during the first trimester; eligible women also had their serum samples collected at their first prenatal visit and the samples were frozen at -80°C for future analysis. This was the first established population-based cohort study in China. It was supported by Key Projects from the National Science & Technology Pillar Program in the Eleventh Five-year Plan Period (2006BAI05A03).

From October 2008 to September 2009, a total of 7,017 pregnant women aged between 18 and 46 years in the ABCD cohort study from three MCH centers in Hefei and four MCH centers in Maanshan were consecutively included in this study. Then, 215 pregnant women were randomized after being selected by computer generated numbers from the cohort and a single telephone interview was performed in order to test the quality of the questionnaires. The results were analysed by Kappa k statistics and the internal agreement was good (K=0.85, 95%CI=0.72-0.91). Of the selected pregnant women, 130 were excluded on the basis of previously defined inclusion criteria (aged 16 years and above, gave written consent, had no birth defect and neonatal death, had no psychiatric illness). This study was approved by the Institutional Review Board of the Anhui Medical University (Approval No. 2008020).

The data for this study were collected as part of the ABCD cohort study. Data on sociodemographic characteristics of age, education, annual household income, and BMI (calculated by dividing the measured body weight (kg) by the squared measured body height (m)) were collected. The number of previous pregnancies, number of living children, and gestational age of the current pregnancy at the time of the interview were requested. In addition, data about obstetric history including number of previous losses, birth defects, neonatal deaths, time after abortion, spontaneous abortions, induced abortions, induced labors, fetal deaths, and still births was also collected.

The center for Epidemiologic Studies-Depression Scale (CES-D) is a 20-item inventory designed specifically to assess duration and frequency of depressive symptoms in the general population. The respondents rated each

symptom experienced during the previous week on a 4-point scale ranging from 0 (rarely) to 3 (all the time), scores of 16 or greater indicate the presence of significant depressive symptoms. This scale demonstrates good test–retest reliability and excellent construct validity (14). This scale has been used frequently to identify the presence of depressive symptoms in pregnant and parenting women (11,15). Cronbach's alpha in this study was calculated as 0.857, indicating acceptable internal reliability.

Anxiety was evaluated by Zung's Self-Rating Anxiety Scale (SAS). The scores of the 20 items in SAS were totaled and multiplied by 1.25. The nearest integer was taken as the standard score. An SAS standard score≥ 50 indicated the presence of anxiety symptoms. Cronbach's alpha in this study was 0.81, indicating acceptable internal reliability (16).

The associations between rate of abortion and characteristics of the pregnant women were tested by the χ^2. The T-test was adopted to differentiate the scores of SAS and CES-D between pregnant women with abortion and those without abortion. Where data were normally distributed with homogeneity of variance, parametric statistical tests were employed, but in the event of skewed distributions and/or heterogeneity of variance, nonparametric methods were used. Kruskal-Wallis H statistics were used to analyze changes of SAS and CES-D scores in women with a history of spontaneous abortion, induced abortion, both spontaneous and induced abortions, and those with no history of abortion.

A high score (≥ 16 points) on CES-D and a high score (≥ 50) on SAS both indicate a case. The odds ratio of being case among pregnant women with a history of abortion to the odds among those with no history of abortion was determined using maximum likelihood logistic regression. Adjusted odds ratios for the association between abortion and cases as determined by SAS and CES-D were derived from logistic regression models that included maternal age, maternal education, BMI, income level, place of residence. To evaluate the effect of modification by gestational age we used stratified analyses. All the logistic regression analyses were performed in the 1st and 2nd trimesters, respectively. The statistical package for the social sciences (SPSS for Windows, version 10.0; SPSS Inc., Chicago, IL, USA) software was used for data analysis. A two-tailed P value < 0.05 was used to denote statistical significance.

RESULTS

Of the 6,887 pregnant women in this stury, 3264(47.4%) had experienced at least one abortion. The rates of spontaneous abortion and induced abortion were 8.3% and 41.6%, respectively. The characteristics of the women are shown in Table 1. The differences between pregnant women with a history of spontaneous abortion and those without one, related to maternal age, BMI, income, paternal age, and weeks of pregnancy, were significant. Furthermore, the difference between pregnant women with a history of induced abortion and those without one regarding maternal age, maternal education, paternal age, and paternal education were also significant.

The pregnant women during their first trimester had significantly higher scores of SAS and CES-D than those during their second trimester (SAS score means: 32.11 vs 31.68, P= 0.000; CES-D score means: 4.59 vs 4.06, P=0.012). Stratified analysis by types of prior abortion yielded a similar result.

Table 2 shows the mean scores for SAS and CES-D questionnaires of each group. Thepregnant women with a history of induced abortion had significantly higher SAS score than those who with no history of induced abortion (P= 0.021) during the first trimester, but this was not the case during the second trimester. With respect to the depression score, the difference between pregnant women with a history of abortion (spontaneous abortion and induced abortion) and controls was not statistically significant during the first and second trimester. During the first trimester, there were no differences between the pregnant women with a history of induced abortion and those with a history of spontaneous abortion in levels of scores for either anxiety or depression (Fig. 1).

We derived a scatter plot of SAS score and CES-D score and the induced abortion rate to explore the possible impact of induced abortion on the mental health of pregnant women during a subsequent pregnancy. A positive and linear correlation was observed between the SAS scores (expressed in median) and induced abortion during the first trimester with a correlation coefficient of 0.655 (P=0.029). Higher percentages of induced abortion clustered around higher SAS scores. While the correlation between induced abortion and CES-D scores was not significantly different (P=0.142).

In the Binary logistic regression model, time after

Table 1: Characteristics of mothers and fathers according to prior spontaneous abortion (SA) and induced abortion (IA).

Variable	N	SA		χ^2/ P value	IA		χ^2/ P value
		No.	rate (%)		No.	rate(%)	
Place of residence				0.16/0.690			0.53/0.468
Rural area	212	16	7.55		83	39.15	
City	6 675	555	8.31		2 780	41.65	
Maternal age (years)				108.15/0.000			31.56/0.000
<25	1 305	53	4.06		498	38.16	
25-29	4 180	313	7.49		1 693	40.50	
≥30	1 402	205	14.62		672	47.93	
Maternal education				1.64/0.441			45.96/0.000
Junior high school(and below)	1 105	94	8.51		493	44.62	
Senior high school	1 852	165	8.91		871	47.03	
College/University(and above)	3 930	312	7.94		1 499	38.14	
BMI				18.70/0.000			0.17/0.918
<18.5	1 539	90	5.85		636	41.33	
18.5-24	4 912	432	8.79		2 042	41.57	
<24	436	49	11.24		185	42.43	
Income				8.63/0.035			2.05/0.563
Low	640	58	9.06		276	43.13	
Middle	2 900	248	8.55		1 209	41.69	
High	2 589	187	7.22		1 053	40.67	
Highest	758	78	10.29		325	42.88	
Paternal age (years)				102.24/0.000			35.39/0.000
<25	350	10	2.86		147	42.00	
25-29	3 373	185	5.48		1 283	38.04	
≥30	3 164	376	11.88		1 433	45.29	
Paternal education (years)				0.43/0.809			74.30/0.000
Junior high school(and below)	693	61	8.80		346	49.93	
Senior high school	1 840	150	8.15		870	47.28	
College/University(and above)	4 364	360	8.25		1 647	37.74	
Pregnant weeks				6.80/0.009			0.24/0.624
<13	3 108	228	7.34		1 302	41.89	
≥13	3 779	343	9.08		1 561	41.31	
Total	6 887	571	8.29		2 863	41.57	

Table 2: Comparisons between anxiety, depression and miscarriage according to week of pregnancy

Variables	CES-D[a]	SAS
The first trimester		
None	4.40±4.77	31.78±6.21
Miscarriage	4.21±3.96	32.31±7.21
Induced abortion	4.85±5.32	32.49±6.46
Both	4.94±4.51	32.78±6.73
F/χ^2	2.538	1.905
P value	0.468	0.127
The second trimester		
None	4.04±5.14	31.57±6.34
Miscarriage	3.70±3.83	31.23±5.04
Induced abortion	4.11±5.20	31.92±6.31
Both	4.41±4.98	31.17±6.21
F/χ^2	0.701	0.991
P value	0.873	0.396

[a]CES-D, Center for Epidemiologic Studies-Depression, due to non-normal distribution of data Kruskal-Wallis test was used.

abortion was included in the analyses. As compared with pregnant women with no history of induced abortion, the women with a history of induced abortion more than 1 year ago (odds ratio 2.14, 95% confidence interval 1.29 to 3.56) were significantly more likely to report a "case" of anxiety during the first trimester in a univariate model. After adjusting for maternal education, income, place of residence and BMI, the analyses yielded similar results. An interesting finding was that the pregnant women with a history of induced abortion less than one year, reported significantly more cases of depression (≥ 16 points in CES-D scale) than those who had no history of abortion during the second trimester(odds ratio 1.66, 95% confidence interval 1.01 to 2.73). After controlling for confounding variables similar results were founded. However, "cases" of depression and anxiety were both

Table 3: Odds ratios (95% confidence intervals) of depression and anxiety after the loss compared with no prior abortion in 6887 pregnancies in China, 2008-2009.

Pregnant weeks, prior abortion	CES-D		SAS	
	OR (95% CI)	Adjusted OR[a] (95% CI)	OR (95% CI)	Adjusted OR[a] (95% CI
The first trimester				
Spontaneous abortion				
No prior abortion (Ref.)	1	1	1	1
≤1 year after abortion	0.51 (0.16~1.62)	0.53 (0.17~1.69)	0.62 (0.15~2.55)	0.64 (0.16~2.64)
>1 year after abortion	0.25 (0.03~1.80)	0.24 (0.03~1.77)	0.92 (0.22~3.81)	0.91 (0.22~3.77)
Induced abortion				
No prior abortion(Ref.)	1	1	1	1
≤1 year after abortion	1.24 (0.70~2.21)	1.18 (0.66~2.10)	1.96 (0.97~3.96)*	1.97 (0.97~4.00)*
>1 year after abortion	1.54 (1.05~2.25)**	1.49 (1.01~2.19)**	2.14 (1.29~3.56)**	2.14 (1.28~3.56)**
The second trimester				
Spontaneous abortion				
No prior abortion(Ref.)	1	1	1	1
≤1 year after abortion	0.17 (0.02~1.20)	0.17 (0.02~1.20)*	0.27 (0.04~1.97)	0.26 (0.04~1.87)
>1 year after abortion	1.26 (0.58~2.74)	1.26 (0.58~2.74)	0.57 (0.14~2.39)	0.55 (0.13~2.25)
Induced abortion				
No prior abortion (Ref.)	1	1	1	1
≤1 year after abortion	1.66 (1.01~2.73)**	1.64 (1.01~2.73)**	1.22 (0.62~2.38)	1.21 (0.62~2.36)
>1 year after abortion	1.18 (0.78~1.78)	1.18 (0.78~1.79)	0.94 (0.55~1.61)	0.95 (0.55~1.62)

[a]Adjusted for maternal education, income, place of residence and BMI

* P<0.1, **p<0.05

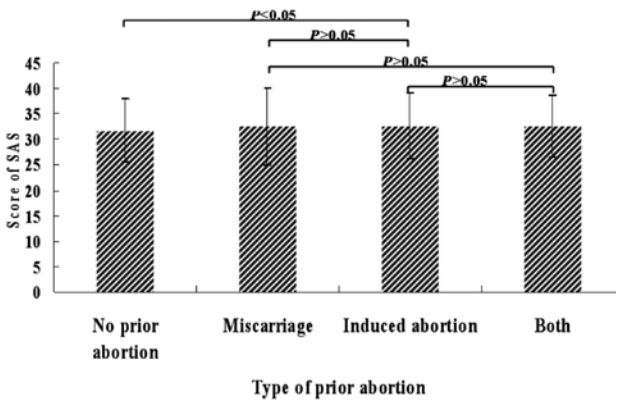

Figure 1: The comparison of SAS among four types of abortion history

equally common in women with history of spontaneous abortion and those with no abortion history (Table 3).

DISCUSSION

Anhui province lies in the hinterland of the Yangtze Delta where there is great economic development potential. Nearly 50% of the pregnant women had experienced unsuccessful pregnancy, and 8.3% and 41.6% of the pregnant women had experienced spontaneous abortions and induced abortions, respectively. Induced abortion in China is legal and is a government service available on request for women. In addition to easy access to contraception, abortion remains imperative to China in achieving its goals of population stability through its one-child policy. China's one-child policy was established by Chinese leader Deng Xiaoping in 1979 to limit China's population growth. Although designated a "temporary measure," it has still been continued a quarter-century after its establishment. The policy limits couples to one child. In rural areas, where approximately 70 percent of the people live, a second child is generally allowed after five years, but this provision sometimes applies only if the first child is a girl, a clear acknowledgment of the traditional preference for boys. Some urban Chinese make the choice to have an induced abortion with the first pregnancy, since they are allowed only one child. In rural areas, most couples are permitted to have a second child, especially if the first was female. If the second (or subsequent) child is female, then the pregnancy often "disappears," allowing the couple to have another child in an attempt to have a son. By the 1970s, abortion was officially termed a 'remedial measure' for realising China's goals of controlling the population (17).

The impact of the prior abortion was not significantly associated with depressive scores, while a positive and linear correlation was observed between the SAS scores

(expressed in mean) and induced abortion during the first trimester with a correlation coefficient of 0.655 ($P < 0.05$). Higher percentages of induced abortion clustered around higher SAS scores. The result was similar with a cross-sectional study conducted by Armstrong (11). However, the difference in the two studies was that the correlation between induced abortion and the depression score was not significantly different. A lack of consensus with regard to the definition of prior loss may provide a partial explanation. As compared to pregnant women with no history of induced abortion, the women with a history of induced abortion more than 1 year ago reported higher anxiety scores during the first trimester. The pregnant women with a history of induced abortion less than one year ago reported significantly more cases of depression than those with no history of abortion during the second trimester. In conclusion, though there were no significant differences between the evaluated groups of women in terms of the scores, when it comes to symptoms or "cases", the association was statistically significant, which indicated that the women with a history of induced abortion were more likely to be diagnosed with certain anxiety or depression disorders, and this result has great clinical importance.

A prospective study conducted in Berlin reported that women with a history of spontaneous abortion suffer more from pregnancy-specific anxieties in the first trimester of a new pregnancy than pregnant women with no history (12). In contrast to the above prospective study, our study revealed that spontaneous abortion was not statistically significantly associated with anxieties during either trimester. However, our study revealed that pregnant women with a history of induced abortion were more likely to score high in SAS than those with no history ($P < 0.05$) during the first trimester, which implies that anxiety can be a possible negative effect of induced abortion. The variation between the two studies is worthy of further investigation.

Some recent studies have reported that anxiety and depression were highest in the first trimester and decreased significantly over the course of pregnancy; therefore, having an abortion history may not have a long-lasting adverse effect on a woman's psychological adaptation during the course of a subsequent pregnancy. Stratified analysis by types of prior loss further verified the validity of the result (7-10,18). Therefore, because women experiencing pregnancy, especially subsequent to perinatal loss, are at increased risk for prenatal anxiety and distress, it is critical to understand the types, patterns, and moderators of anxiety and distress experienced by this population in order to develop interventions to prevent undesirable stress-related outcomes. We only found a slight change in the mean scores of CES-D and SAS between the first trimester and second trimester in this study, which may be worthy of further study in China.

An induced abortion is the result of a decision made after days or weeks of consideration and the woman is usually mentally prepared when she arrives at the hospital. Nevertheless, the discovery of the pregnancy can be a shock, and the period prior to the abortion can be distressing. The process of deciding to have an abortion can be difficult, and the reasons for electing to have an abortion can affect the psychological responses after the event (19). Thus, the social, moral, and psychological context of an induced abortion may be more complicated than that of a spontaneous abortion, and may result in different psychological responses (20). Two previous studies have reported that the mental health of pregnant women with a history of induced abortion was poorer than those with a history of spontaneous abortion. Women with a history of induced abortion were more anxious and depressed than woman with history of spontaneous abortion (21,22). In contrast, a five-year longitudinal study found that compared with the general population women who had experienced a spontaneous abortion or an induced abortion both had significantly higher anxiety and depression scores; however, there were no statistically significant differences between the two pregnancy termination groups, a result that is in line with our findings (20). Furthermore, in a 2-year following-up study related to the psychological impact on women of spontaneous abortion versus induced abortion, the short-term emotional reactions to spontaneous abortion appear to be larger and more powerful than those to induced abortion. In the long term, however, women who had induced abortion reported significantly more avoidance of thoughts and feelings related to the event than women who had a spontaneous abortion, which indicated the different characteristics of the two pregnancy termination events (23). Interpretation of the results was further complicated by the wide

variation in the timing of subject assessment ranging from within a few weeks to months or even years after the loss, the absence of a coincident measure skill, different study designs, and cultural differences. More rigorous research containing diverse samples and a meta-analysis would likely provide a better understanding of the different influences of prior spontaneous abortion and prior induced abortion on pregnant women.

Although there is a dearth of research specifically examining the relationship between perinatal loss and anxiety, the research that has been conducted focusses mainly on the incidence of increased anxiety symptomatology, rather than specific anxiety disorders, following perinatal loss (7). SAS is a rating instrument for the measurement of anxiety as a clinical entity and was devised as an attempt to quantitate the symptoms of this disorder, which can differentiate specific anxiety disorders from patients with other diagnoses (correlation between the SAS scores for patients with a diagnosis of anxiety disorder was 0.74), whereas the Taylor Manifest Anxiety Scale (TMAS) did not (16). Therefore, we can examine the relationship between perinatal loss and anxiety disorder by using SAS. The evidence of content and concurrent validity was evaluated during the development of the SAS by comparisons with other measures of anxiety, the Taylor Manifest Anxiety Scale (TMAS), and the Anxiety Status Inventory (ASI). Cronbach's alpha in this study was 0.81, indicating acceptable internal reliability.

Factors that moderate the impact of abortion may vary with time since the loss (15). Our findings indicated that as compared with pregnant women with no history of induced abortion, the pregnant women with a history of induced abortion had significantly higher anxiety symptoms during the first trimester, but the correlation was not significant during the second trimester. In China, most pregnant women had induced abortions performed in the first trimester, and it was always believed that having induced abortions performed in the gestational weeks ≥13 was dangerous and could cause more complications. A study by Fertl and Bergner revealed that anxiety was markedly elevated until the week of gestation of the prior pregnancy loss and diminished after passing this critical window of time. Pregnant women with one prior abortion might be able to untie the emotional connection between the painful experience and their current situation by passing the critical period of time (8). In a recent study Côté-Arsenault concluded that women reported an increased sense of security about the pregnancy and baby over time but this security was easily shaken. For women with a history of later or multiple losses, anxiety may remain high or increase as the due date approaches (24). An interesting finding of our study was that the pregnant women with a history of induced abortion less than one year ago reported significantly more "cases" of depression (≥ 16 points in CES-D scale) than those who had no induced abortion during the second trimester. This finding indicated that induced abortion might only be associated with depressive "cases" rather than depression scores. Furthermore, the effect between anxiety and depression cases and prior induced abortion might have been moderated by time since loss, and there were variations between the first and second trimesters. Recent review articles indicate that anxiety is more important after spontaneous abortion and induced abortion than it has been recognized to date (25,26). Understanding the emotional responses after a pregnancy termination may enable health personnel to better distinguish those women, who need extra help and follow-up and provide insight into the needs of these families at this critical time.

Some limitations of this study should be noted. Interpretation of the findings was restricted by the use of inconsistent methodological practices and a lack of consensus with regards to the definition of spontaneous abortion and induced abortion. The low participation rate was another limitation of the study, and regarding the nature and direction of possible selection bias, the pregnant women who did not participate in the study might have had more problems than those who did participate.

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References:

1. Sedgh G, Henshaw SK, Singh S, Bankole A, Drescher J. Legal abortion worldwide: incidence and recent trends. Perspect Sex Reprod Health 2007;39(4):216-25.

2. Zeng LX, Yan H, Chen ZJ. Study on the current status and risk factors of spontaneous abortion of women at reproductive age in rural areas of Xianyang district, Shanxi province. Zhonghua Liu Xing Bing Xue Za Zhi 2007;28(1):19-23.

3. Lok IH, Neugebauer R. Psychological morbidity following miscarriage. Best Pract Res Clin Obstet Gynaecol 2007;21(2):229-47.

4. Cumming GP, Klein S, Bolsover D, Lee AJ, Alexander DA, Maclean M, Jurgens JD, et al. The emotional burden of miscarriage for women and their partners: trajectories of anxiety and depression over 13 months. BJOG 2007;114(9):1138-45.

5. Broen AN, Moum T, Bödtker AS, Ekeberg O. Predictors of anxiety and depression following pregnancy termination: a longitudinal five-year follow-up study. Acta Obstet Gynecol Scand 2006;85(3):317-23.

6. Nansel TR, Doyle F, Frederick MM, Zhang J. Quality of life in women undergoing medical treatment for early pregnancy failure. J Obstet Gynecol Neonatal Nurs 2005;34(4): 473-81.

7. Geller PA, Kerns D, Klier CM. Anxiety following miscarriage and the subsequent pregnancy: a review of the literature and future directions. J Psychosom Res 2004;56(1):35-45.

8. Fertl KI, Bergner A, Beyer R, Klapp BF, Rauchfuss M. Levels and effects of different forms of anxiety during pregnancy after a prior miscarriage. Eur J Obstet Gynecol Reprod Biol 2009;142(1):23-9.

9. Côté-Arsenault D. Threat appraisal, coping, and emotions across pregnancy subsequent to perinatal loss. Nurs Res 2007;56(2):108-16.

10. Tsartsara E, Johnson MP. The impact of miscarriage on women's pregnancy-specific anxiety and feelings of prenatal maternal-fetal attachment during the course of a subsequent pregnancy: an exploratory follow-up study. J Psychosom Obstet Gynaecol 2006;27(3):173-82.

11. Armstrong DS. Impact of prior perinatal loss on subsequent pregnancies. J Obstet Gynecol Neonatal Nurs 2004;33(6):765-73.

12. Bergner A, Beyer R, Klapp BF, Rauchfuss M. Pregnancy after early pregnancy loss: a prospective study of anxiety, depressive symptomatology and coping. J Psychosom Obstet Gynaecol 2008;29(2):105-13.

13. Alder J, Fink N, Bitzer J, Hösli I, Holzgreve W. Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. J Matern Fetal Neonatal Med 2007;20(3):189-209.

14. Radloff, LS. The CES-D scale: a self-report depression scale for research in the general population. Applied Psychological Measurement 1977;1(3):385-401.

15. Neuqebauer R. Depressive symptoms at two months after miscarriage: interpreting study findings from an epidemiological versus clinical perspective. Depress Anxiety 2003;17(3): 152-61.

16. Zung WW. A rating instrument for anxiety disorders. Psychosomatics 1971; 12(6):371-9.

17. Hesketh T, Lu L, Xing ZW. The effect of China's one-child family policy after 25 years. N Engl J Med 2005; 353(11):1171-6.

18. Woods-Giscombé CL, Lobel M, Crandell JL. The impact of miscarriage and parity on patterns of maternal distress in pregnancy. Res Nurs Health 2010;33(4):316-28.

19. Broen AN, Moum T, Bödtker AS, Ekeberq O. Reasons for induced abortion and their relation to women's emotional distress: a prospective, two-year follow-up study. Gen Hosp Psychiatry 2005;27(1):36-43.

20. Broen AN, Moum T, Bödtker AS, Ekeberq O. The course of mental health after miscarriage and induced abortion: a longitudinal, five-year follow-up study. BMC Med 2005;3:8.

21. Benute GR, Nomura RM, Pereira PP, Lucia MC, Zugaib M. Spontaneous and induced abortion: anxiety, depression and guilty. Rev Assoc Med Bras 2009;55(3):322-7.

22. Cougle JR, Reardon DC, Coleman PK. Generalized anxiety following unintended pregnancies resolved through childbirth and abortion: a cohort study of the 1995 National Survey of Family Growth. J Anxiety Disord 2005;19(1):137-42.

23. Broen AN, Moum T, Bödtker AS. Psychological impact on women of miscarriage versus induced abortion: a 2-year follow-up study. Psychosom Med 2004;66(2):265-71.

24. Côté-Arsenault D, Donato KL. Restrained expectations in late pregnancy following loss. J Obstet Gynecol Neonatal Nurs 2007;36(6):550-7.

25. Brier N. Anxiety after miscarriage: a review of the empirical literature and implications for clinical practice. Birth 2004;31(2):138-42.

26. Bradshaw Z, Slade P. The effects of induced abortion on emotional experiences and relationships: a critical review of the literature. Clin Psychol Rev 2003;23(7): 929-58.