



ORIGINAL RESEARCH – QUANTITATIVE

Effects of prenatal maternal mental distress on birth outcomes

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ABSTRACT

Background: Adverse effects of maternal mental distress during pregnancy have been extensively investigated, but the impact of prenatal maternal mental distress at various time periods during pregnancy on birth outcomes is rarely discussed. By understanding the relationship between maternal mental distress and unfavourable birth outcomes throughout pregnancy, appropriate evidence-based preventative care or intervention may be adopted in a timely manner.

Aim: This study intended to investigate the effects of maternal stress, anxiety, and depressive symptoms across pregnancy on preterm birth and low birth weight.

Methods: With a prospective longitudinal design, this study used the 10-item Perceived Stress Scale, Center for Epidemiologic Studies Depression Scale, and Zung Self-reported Anxiety Scale to investigate 197 participants who, at greater than 24 gestational weeks, completed the self-administered questionnaires during regular checkups in a hospital in southern Taiwan. Descriptive statistics, Mann–Whitney *U* test/Kruskal–Wallis test, and hierarchical logistic regression were applied for data analysis.

Findings: The study found that anxiety and depressive symptoms at 25–29 gestational weeks could predict preterm birth, and that anxiety at greater than 30 gestational weeks was able to predict low birthweight. However, stress was not able to predict any kind of negative birth outcomes.

Conclusion: Adverse birth outcomes were somewhat predictable by maternal mental distress; therefore, we suggested that prenatal visits incorporate psychological assessment for early detection and management to prevent possible adverse birth outcomes.

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Summary of relevance:

Problem

The impact of prenatal maternal mental distress at various time periods during pregnancy on birth outcomes is rarely discussed.

What is already known

Certain prenatal negative psychosocial emotions may activate the hypothalamic–pituitary–adrenal (HPA) axis and further suppress the immune system of a pregnant woman; the chronicity and/or excessive activation of the HPA axis can lead to adverse health outcomes.

What this paper adds

Anxiety and depressive symptoms at 25–29 gestational weeks could predict preterm birth whereas anxiety at greater than 30 gestational weeks was able to predict infant low birth weight.

1. Introduction

Certain psychological distress experienced by women during pregnancy may cause adverse effects on birth outcomes. Among various adverse birth outcomes, preterm birth and low birth weight have gained extensive attention. Preterm birth is a significant cause of neonatal morbidity and mortality.¹ Most premature babies are born underweight, and those with very low birth weight often face medical conditions and are likely to have growth and development issues.^{2,3} In 2010, the estimated

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average preterm birth rate in 184 countries, excluding Taiwan, was 11.1%.⁴ Although premature birth rate (9.05%) in 2013 in Taiwan was lower compared to the global average figure, more than half of those premature infants (56.33%) were born with low birth weight.⁵ Due to the high costs of hospitalisation and treatment for premature birth or low birth weight,⁶ health researchers and professionals have tried to understand the causes and related factors of these two unfavourable birth outcomes.

From a physiological point of view, certain prenatal maternal psychosocial factors such as stress and other negative emotions may activate the hypothalamic–pituitary–adrenal (HPA) axis and further suppress the immune system of a pregnant woman; the chronicity and/or excessive activation of the HPA axis can lead to adverse health outcomes, including preterm birth and low birth weight.⁷ Based on this aspect, many researchers devoted themselves to confirming the relationship between maternal mental distress (e.g. stress, anxiety, and depression) and negative birth outcomes (e.g. premature birth and low birth weight). However, the evidence linking maternal mental distress to adverse birth outcomes is inconclusive. While some studies have confirmed that stress, depression, or anxiety is related to prematurity or low birth weight, other studies yielded very small or non-significant evidence.^{8–11} Although the correlation has not yet been confirmed, adverse effects of maternal mental distress during pregnancy have been vastly investigated; yet the impact of prenatal maternal mental distress on birth outcomes at various time periods during pregnancy is rarely discussed. By understanding the relationship between maternal mental distress and unfavourable birth outcomes throughout pregnancy, proper preventative care or treatment intervention might be adopted at the right time for the right person. Therefore, we conducted this research to understand (a) whether adverse birth outcomes (i.e. preterm birth or low birth weight) can be predicted by prenatal maternal mental distress (i.e. stress, anxiety, or depressive symptoms), and (b) at what time during pregnancy can prenatal maternal mental distress predict adverse birth outcomes? In this present study, preterm birth was defined as births before 37 weeks of gestation and low birth weight was defined as weight at birth less than 2500 g.

2. Participants, ethics and methods

2.1. Pilot study

A pilot test was first conducted to help determine proper sample size for the main study. The pilot study was a cross-sectional study design. One-hundred thirty women who were pregnant over 24 gestational weeks were recruited to complete a set of questionnaires measuring anxiety, depressive symptoms, and stress. We found in the pilot study that the correlation coefficient between stress, depressive symptoms, and anxiety was between 0.45 and 0.66. Using the G*Power analysis program with critical value of 0.05 and two-tailed test, 47 and 16 participants respectively were needed to achieve a power of 90%.

2.2. Main study

2.2.1. Design

This study used a prospective longitudinal design to explore the impact of prenatal maternal mental distress on birth outcomes. The participants were recruited when they were over 24 gestational weeks and were followed up monthly, finishing with a total of three survey times (T1: 25–29 gestational weeks, T2: 30–34 gestational weeks, T3: >34 gestational weeks).

2.2.2. Sampling

Pregnant women who were 18 years of age or older, able to read and write Chinese, over 24 gestational weeks, singleton, and who did not have any pregnancy complications (including diagnosed psychological disorders) were invited to participate in the study.

Based on the sample size estimated using the results of the pilot study and a high attrition rate anticipated due to the longitudinal design of this present study,¹² we invited as many participants as possible during the study period between February 2010 and October 2011. In the beginning, 264 pregnant women were approached and 56 declined to participate. With 11 dropouts after the second survey, 197 participants completed the entire study (response rate = 74.62%). One participant did not complete the T2 survey and three did not complete the T3 survey due to preterm birth; therefore, there were 197, 196, and 194 valid questionnaires at T1, T2 and T3, respectively. There were no statistically significant differences in the demographic variables between those women that dropped out of the study and participants that were retained.

2.2.3. Instruments

Three instruments were used to assess the participants' levels of stress, depressive symptoms and anxiety.

2.2.3.1. Perceived stress. We used the 10-item Perceived Stress Scale (PSS-10) to measure the degree by which situations were appraised as stressful in one's life.¹³ It is a 10-item, five-point scale, ranging from 0 to 4. A higher score on the PSS-10 indicates a higher level of perceived stress. The scale has been translated into Chinese and used among Chinese new mothers,^{14,15} and the reliability of the Chinese version was satisfactory (Cronbach's alpha = 0.87). The Cronbach's alpha of the PSS-10 in this study was 0.87.

2.2.3.2. Depressive symptoms. Developed by Radloff, the Center for Epidemiologic Studies Depression Scale (CES-D), a 20-item, four-point (scores 0–3) response, self-reported scale was used to measure the participants' level of depressive symptoms. The higher the score, the greater the severity of depressive symptoms experienced.¹⁴ In Radloff's original work, the cutoff point for depression was 16, with the Cronbach's alphas ranging from 0.84 to 0.90, and the 2, 4, 6, and 8 weeks of test–retest correlations ranging from 0.51 to 0.67.¹⁴ The CES-D has been used in Chinese new mothers with satisfactory Cronbach's alphas.^{15,16} The Cronbach's alpha of the CES-D in this study was 0.89.

2.2.3.3. Perceived anxiety. Developed to evaluate the presence of anxiety, the Zung Self-reported Anxiety Scale (SAS) is a 20-item, four-point (scores 1–4) scale.¹⁷ A higher score indicates a higher perceived level of anxiety. The SAS has been validated among Vietnamese women during perinatal period (Cronbach's alpha = 0.76)¹⁸ and among Chinese women with a history of spontaneous abortion or induced abortion during a subsequent pregnancy with a satisfactory internal consistency (Cronbach's alpha = 0.81).¹⁹ The reliability of the SAS in this study was tested using the data gathered at the first time period (25–29 gestational weeks). Results showed that the Cronbach's alpha of the whole scale was 0.65, and two items (“I can breathe in and out easily” and “I fall asleep easily and get a good night's rest”) had negative, low item–total correlation coefficients ($r = -0.02$ and -0.14 , respectively). By deleting these two items, the Cronbach's alpha increased to 0.72, and factor analysis showed that the remaining 18 items could explain 53.39% of the variance of anxiety. The 18-item SAS was therefore used in the study for subsequent data collections.

2.2.4. Procedure

Before the study commenced, an approval of the study protocol from the Institutional Review Board was obtained by the

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