

IS THERE ANY ASSOCIATION BETWEEN MATERNAL DEPRESSION AND BIOPHYSICAL PROFILE?

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Abstract- Mother's mental health status during pregnancy has important effects on fetal growth and development. However, there are few studies concerning association of maternal depression and biophysical profile (BPP) of the fetus. We performed this research to know if maternal depression has any association with fetal BPP score. For measuring depression, Farsi version of Patient Health Questionnaire-9 (PHQ-9) was completed. A total of 100 pregnant women in their third trimester (>24 weeks) who had not hyperthyroidism, hypothyroidism, eclampsia and preeclampsia, fever, infection, diabetes or a fetus with intrauterine growth retardation (IUGR) and were not using any medication entered the study. Spearman correlation coefficient between the score of PHQ-9 questionnaire and BPP score was -0.08 ($P = 0.43$). Based on Kruskal Wallis test, there was no difference in BPP score of depressed and nondepressed women ($P = 0.65$). We found no relationship between maternal depression and BPP score in third trimester of pregnancy. Further studies for elucidating neuro-hormonal mechanisms related to the result of our study are suggested.

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INTRODUCTION

Mother's mental health during pregnancy has important effects on fetal growth and development. Maternal stress is a known risk factor for fetal and maternal health. Women with a poor psychosocial profile and who are depressed during pregnancy are at increased risk of giving birth to low birth weight and preterm infants (1).

A study comparing 45 pregnant women with symptoms of depression with 45 pregnant women without symptoms of depression showed that fetal

activity was significantly higher among depressed mothers (2). Another study has showed that maternal psychological variables may be associated with neurobehavioral development of the fetus (3). A pilot study showed maternal anxiety during pregnancy may have a significant effect on fetal behavior (4). Considering the life long effects of antenatal anxiety and stress on the children's health, programs to reduce maternal stress during pregnancy are warranted (6).

Despite increasing interest to the role of maternal stress in fetal growth, little information exists about nature of fetal intrauterine response to maternal mental status (5). As there are only one study about maternal depression and fetal activity (2), we designed this study to determine whether maternal depression has any association with fetal biophysical profile (BPP) score.

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MATERIALS AND METHODS

As a cross sectional study using consecutive sampling technique, we selected 135 pregnant women who were in their third trimester (> 24 weeks) and referred to ultrasound section of Ali Nassab Hospital, the major provincial hospital of Iranian Social Security Organization, for routine fetal monitoring. There are a few disorders that may affect BPP score, including: maternal hyperthyroidism and hypothyroidism, eclampsia, preeclampsia, maternal fever, maternal infection, using beta blocker by mother, maternal diabetes and the fetus with IUGR (7). After excluding pregnant women who had these conditions, the size of our sample dropped to 114. Fourteen pregnant women didn't accept to response to any question about depression so our final sample size was 100. The study was approved by Ethics Committee of Tabriz University of Medical Sciences and written informed consent was obtained from all subjects.

To diagnose major depression, we used Farsi version of Patient Health Questionnaire (PHQ-9). This newly developed questionnaire is based on DSM-IV criteria and is used increasingly by researchers in United States. The Farsi version of questionnaire was validated in Iran by the first author (8). Compared to psychiatrist diagnosis, the cut point of 10 distinguishes major depression from other type of depressive patients with 87% sensitivity and 89% specificity. Based on PHQ-9 scoring, intensity of depression is divided into 5 categories: none (score 0 to 4), mild depression (score 5 to 9), moderate depression (score 10 to 14), moderately severe depression (score 15 to 19) and severe depression (score 20 to 27). These findings are similar to the original research conducted by developer of questionnaire in United States (9).

After completing PHQ-9, a radiologist who was blind to patient's depression score measured BPP score by ultrasound. BPP score integrates 5 parameters: non stress test (NST), fetal tonicity, fetal movement, fetal respiratory rate and amniotic fluid index (AFI).

We used Kruskal Wallis test to compare mean of BPP score between 5 categories of depression. We also used Mann-Whitney U test to find any association between severities of depression with each 5 parameters of BPP score separately. We also calculated Spearman correlation coefficient for measuring association between PHQ-9 score of patients and their BPP score. $P < 0.05$ was considered statistically significant.

RESULTS

The characteristics of our sample are shown in Table 1. Table 2 shows frequency of five categories of depression severity based on PHQ-9 scoring system and mean value and standard deviation (SD) of BPP score separately by each category.

Kruskal Wallis test showed that BPP score is not different between 5 categories of depression. Mann-Whitney U test showed that in all of five parameters of BPP score mean of depression score was not different between normal and abnormal results (results not shown). Also Spearman correlation coefficient between depression score and BPP score was -0.08 ($P = 0.43$). This shows a very weak negative linear correlation between depression score and BPP score which is not significant.

Table 1. Characteristics of the pregnant women (n=100)

Characteristic	Frequency (%)
Age	
<18	5
18-35	78
>35	17
Education	
Primary	8
Secondary	67
Academic	25
Job	
Housewife	61
Employed	39
Number of alive children	
0	22
1-2	70
> 2	8

Table 2. Frequencies of five categories of depression severity and mean (SD) of biophysical profile score (n=100)

Depression severity	Frequency (%)	Mean (SD) of BPP score*
Non	19	8.63 (1.64)
Mild	37	8.92 (1.53)
Moderate	23	8.70 (1.87)
Moderately severe	13	8.50 (1.41)
Severe	8	8.68 (1.66)

* $P = 0.65$ in Kruskal Wallis test.

DISCUSSION

We found no statistically significant association between depression and BPP score and its 5 parameters. There is only one published study about the effects of maternal depression on fetal activity that was conducted in United States (2). Increased fetal activity that was measured in this study isn't based on BPP scoring (7). Because of this methodological difference we couldn't compare our results with that study.

Lack of any association between depression and BPP score in our sample may be related to specific pattern of hormonal and neural response to depression and levels of stress hormones in maternal blood and effects of these hormones and neurotransmitters on placenta. Molecular and cellular mechanisms explaining the effects of maternal mental health on fetal physiology have been reviewed in detail by Wadhwa (10), Huizink (11) and Federenko *et al.* (12).

Similar to our result but about another psychiatric disorder, Sjöström *et al.* showed that there is no association between maternal anxiety in third trimester and fetal heart rate and fetal movement (13). In contrast, Monk's study illustrates that there is a positive association between maternal anxiety in third trimester and fetal heart rate (3). Further studies for elucidating neuro-hormonal mechanisms related to the result of our study are suggested.

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Conflicts of interests

We have no competing interests.

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