ORIGINAL ARTICLE

Maternal and fetal Doppler velocimetry in women diagnosed with fear of childbirth

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Abstract

Aim: This study aimed to investigate maternal and fetal Doppler flow parameters in term pregnant women diagnosed with fear of childbirth (FOC).

Materials and Methods: Women between 20 and 40 years with full-term singleton pregnancies (≥37 gestational weeks) were included in the study. All patients were questioned with Turkish form of Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ) version A. Women with W-DEQ scores ≥85 were defined as FOC. Forty women diagnosed with FOC (FOC group) and 45 women with W-DEQ scores <85 (control group) underwent Doppler waveform analysis and the pulsatility index (PI) and resistance index (RI) values for uterine, umbilical, and mid cerebral arteries were recorded.

Results: Both groups had similar PI and RI values for umbilical and mid cerebral arteries ($P > 0.05$). However, PI and RI values for both right and left uterine arteries were higher in FOC group than control group ($P < 0.05$, for right uterine artery PI; $P < 0.001$, for left uterine artery RI; and $P < 0.01$, for others).

Conclusion: It may be suggested that the presence of FOC in term pregnant women seems to have a negative effect on uterine blood flow parameters. When diagnosed with FOC, the women should be referred to a specialist for psychoeducation and psychosomatic support to decrease her fear and to minimize the negative impact of fear on the fetus.

Key words: Childbirth, Doppler, fear, fetus, pregnancy, ultrasound

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Introduction

Studies show that fear of childbirth (FOC) in pregnant women may lead to negative influence on the women's daily life,[1] prolongation in labor duration,[2] and increase in mother's request for cesarean section.[3] FOC may cause a delay in mother–infant relationship and an increase in the risk of postpartum depression.[4] Prevalence of FOC varies from 5% to 20%.[5,6] The risk factors for FOC were identified as high and unspecified socioeconomic status, advanced maternal age, depression, and a previous cesarean section.[3] A strong association was found between FOC and a previous subjectively negative birth experience.[7] However, fear levels were found to be higher in nulliparous women than those of multiparous women.[8]

Anxiety sensitivity was reported as an important vulnerability factor for FOC,[9] and severe FOC was observed in women with anxiety disorders.[10] Maina *et al.*[11] investigated the association between maternal anxiety disorders and intrauterine growth abnormality, low birth weight, and preterm birth. They found normal uteroplacental or fetoplacental vascularization in all

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patients. However, they reported a significant association between maternal psychiatric disorders and a lower birth weight. In another study,[12] uterine artery resistance was found to be modestly associated with the maternal psychological milieu during gestation.

Based on the above information, we hypothesized that women with FOC may have increased vascular resistance in maternal and fetal vascular beds due to maternal psychological stress. For this purpose, we investigated pulsatility index (PI) and resistance index (RI) values for uterine, umbilical, and mid cerebral arteries in term pregnant women who were diagnosed with FOC, and we compared these values with those women without FOC.

Materials and Methods

Subjects were recruited from pregnant women attending Obstetric Department of Nenehatun Hospital, Erzurum, Turkey, from February 1, 2014, to June 20, 2014 (mean annual delivery rate: 6000 deliveries). Written informed consent was obtained from all participants, and the study was approved by the Ethics Committee of the Medical Faculty, Ataturk University, Erzurum, Turkey. Women between 20 and 40 years with full-term singleton pregnancies (≥37 gestational weeks), nonsmoking, Turkish origin were enrolled in this study. Initially, last menstrual period was questioned, and gestational age was confirmed by ultrasonography. Furthermore, ultrasonography was used to evaluate fetal abnormalities and to measure estimated fetal weight. Patients with no certain menstrual history, complicated pregnancies (e.g., chronic or gestational hypertension, preeclampsia, and placenta previa), fetal abnormalities, multiple pregnancies, smoking, alcohol use, current treatment for depression or anxiety disorders, and chronic illnesses (e.g., hypertension and diabetes mellitus) were excluded from the study.

All patients were questioned with Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ) form A. W-DEQ form A is used to measure the level of FOC in pregnant women, and it includes 33 items about women's cognitive appraisal and expectancies of childbirth.[13] In this study, we used the Turkish form of W-DEQ version A which was fixed as reliable and valid to measure the level of FOC among Turkish women by Korukcu *et al*.[14] Answers were given on six scale steps per item ranging from 0 (not at all) to 5 (extremely) and the FOC level was evaluated according to total W-DEQ scores. Women with W-DEQ scores ≥85 was defined as FOC (7). Maternal age, gestational week, parity, body mass index, and total W-DEQ scores of patients were recorded.

Forty women diagnosed with FOC (FOC group) and 45 women with W-DEQ scores <85 (control group) underwent Doppler waveform analysis. To minimize the interoperator variability, all ultrasonographic scans were performed by the same operator blinded to group assessment between 10.00 and 12.00 pm. All measurements were performed using Pulse Doppler 5 MHz transabdominal probe (Mindray, China) in the absence of fetal or breathing movements. Three consecutive waveforms were obtained, and the average of three measurements was used for statistical analysis. Uterine artery on each side was visualized at the point just distally to the crossover with the iliac artery. Middle cerebral artery was visualized in a transverse axial view of the fetal head, and umbilical artery was examined on a free loop of the umbilical cord. The PI and RI values for uterine, umbilical, and mid cerebral arteries were recorded.

A power analysis for this study was calculated based on the work of Mendelson *et al*.[12] using the Russ Lenth's power and sample size calculation application,[15] 35 patients in each group were needed to detect a mean difference of 0.5 standard deviation (SD) between groups with a power of 80% at 5% significance level.

Data were analyzed using SPSS software 12.0 (SPSS Inc., Chicago, IL, USA) and expressed as mean ± SD, $P < 0.05$ was considered significant. The normality of variables was tested using the Kolmogorov–Smirnov test. If the data were not normally distributed, Mann–Whitney U-test was used. Comparisons were done using the independent samples *t*-test when the data were normally distributed, and the Fisher's exact test was used to compare the percentage values.

Results

During the study period, 400 multiparous women, of whom 350 agreed to participate, met the inclusion criteria for the study. All participants were questioned with the W-DEQ form A. Forty women had W-DEQ scores ≥85 and 310 women had W-DEQ scores below 85. A power analysis for this study revealed that 35 patients in each group were needed to obtain a power of 80%. Hence, 45 patients without FOC were randomly selected using a computer-generated random number table. Eventually, 40 women diagnosed with FOC and 45 women with no FOC underwent Doppler waveform analysis. Women with W-DEQ score ≥85 referred to a specialist for psychoeducation and psychosomatic support.

Clinical characteristics and mean W-DEQ scores of participants were presented in Table 1. There were no differences between groups in terms of maternal age, parity, body mass index, gestational week values, and estimated fetal weight by ultrasound. Control group had lower W-DEQ scores compared with FOC group ($P < 0.001$). Doppler flow parameters in groups were presented in Table 2. Both

Table 1: Clinical characteristic and mean Wijma Delivery Expectancy/Experience Questionnaire scores in groups

	Control group (n=45)	FOC group (n=40)	P
Age (years)	28.45±3.86	30.07±4.54	0.089
BMI (kg/m^2)	28.26±2.92	29.16±2.27	0.118
Parity	2.62±1.13	2.62±1.05	0.991
Mean gestational age (weeks)	38.87±1.33	38.83±1.14	0.888
Mean W-DEQ scores	64.15±7.05	90.62±4.77*	<0.001
Estimated fetal weight by ultrasound (g)	3317.77±343.96	3345.00±306.30	0.702

*P<0.001; compared with the control group. Data were expressed as mean±SD SD=Standard deviation; W-DEQ=Wijma Delivery Expectancy/Experience Questionnaire; BMI=Body mass index; FOC=Fear of childbirth

Table 2: Doppler flow parameters in groups

	Control group (n=45)	FOC group (n=40)	P
Right uterine artery PI	0.75±0.36	0.95±0.53*	0.043
Right uterine artery RI	0.40±0.10	0.58±0.32†	0.001
Left uterine artery PI	0.77±0.37	1.09±0.61†	0.004
Left uterine artery RI	0.44±0.07	0.59±0.18**	<0.001
Umbilical artery PI	0.83±0.28	0.84±0.30	0.982
Umbilical artery RI	0.54±0.11	0.55±0.12	0.880
Mid cerebral artery PI	1.71±0.76	1.50±0.52	0.144
Mid cerebral artery RI	0.76±0.26	0.78±0.27	0.053

*P<0.05; **P<0.001; †P<0.01. Compared with control group PI=Pulsatility index; RI=Resistance index; FOC=Fear of childbirth

groups had similar PI and RI values for umbilical and mid cerebral arteries ($P > 0.05$). However, PI and RI values for both right and left uterine arteries were higher in FOC group than control group ($P < 0.05$, for right uterine artery PI; $P < 0.001$, for left uterine artery RI; and $P < 0.01$, for others) [Table 2].

Discussion

The differences in maternal and fetal Doppler flow parameters in full-term pregnant women diagnosed with FOC were evaluated. The values of PI and RI for umbilical and mid cerebral arteries in women diagnosed with FOC were similar to values in women without FOC. However, we found higher PI and RI values for both left and uterine arteries in women diagnosed with FOC when compared to the control group.

Despite modern advances in obstetric, FOC has been seen in pregnant women at rates varying between 5% and 20%.[5,6] The most frequent fears in women with FOC were reported as fear for the child's health (50%) and fear of pain (40%).[16] In this study, 40 of 350 women were diagnosed with FOC (11.4%). A negative birth experience was found to be most important factor for explaining FOC during pregnancy by Størksen *et al*.[7] However; a recent study reported a high prevalence (15.6%) of FOC in women with positive birth experience.[17] Furthermore, a strong association was found among FOC, maternal age, pregnancy planning status, and maternal request for cesarean section.[17]

Studies showed that patients with anxiety disorders are susceptible to create severe FOC.[9,10] We observed higher PI and RI values for uterine arteries in women diagnosed with FOC compared with women without FOC. This increase might be explained with stress-induced increases in the production of vasoconstrictor substances such as endothelin, adrenaline, or serotonin by activation of sympathetic nervous system. Elevated levels of vasoconstrictor substances may contribute to fear-associated decreases in uterine artery blood flow. Indeed, a higher degree of fear during pregnancy was found to be associated with increased plasma adrenaline concentrations.[18] Similar to our results, Teixeira *et al*.[19] showed a significant association between maternal anxiety in pregnancy and increased uterine artery RI. Furthermore, Harville *et al*.[20] indicated that high levels of corticotropin-releasing hormone caused by psychosocial stress during pregnancy may be associated with higher placental resistance.

In contrast to our results, Kent *et al*.[21] found no association between maternal anxiety and uterine artery RI at 20 weeks of gestation in healthy primigravid women with normally developing pregnancies. In another study, Maina *et al*.[11] found no abnormal placental vascularization in mothers with psychiatric disorders. However, our study population was created with full-term pregnant women. We measured maternal and fetal Doppler flow parameters on or after 37 weeks gestation because studies have shown a rising tendency for fear and anxiety following the advancing gestational week.[22,23] Whereas ultrasound examinations were performed at 20th week of pregnancy in Kent *et al*.'s[21] study and, at 20th and 34th gestational weeks in Maina *et al*.'s[11] study.

Some studies reported an elevated rate of elective and emergency cesarean sections in women diagnosed with FOC.[24,25] Moreover, Sydsjö *et al*.[26] concluded that FOC is a predisposing factor for emergency and elective cesarean section even after psychological counseling. Based on our results, we suggested that maternal stress caused by FOC may influence fetal heart rate by reducing the uterine blood flow. We also suggested that these alterations in fetal heart rate may be a cause for increased emergency cesarean section rate in women with FOC. Several studies support our suggestions.[27,28] Sjöström *et al*.[27] showed that women's acute emotional reactivity during pregnancy can influence fetal heart rate patterns. Monk *et al*.[28] also reported a possible association between maternal anxiety and the variability of fetal heart rate.

Our study has several limitations. One limitation is the fact that we have no information about birth weights and Apgar scores of fetuses, which may be affected by FOC level. Another limitation is the relatively small patient population.

Conclusion

We first evaluated higher PI and RI values for both right and left uterine arteries in women diagnosed with FOC compared with women without FOC. It may be suggested that the presence of FOC in term pregnant women seems to have a negative effect on the uterine blood flow parameters. FOC screening should be a routine part of prenatal care for all women. When diagnosed with FOC, the women should be referred to a specialist for psychoeducation and psychosomatic support to decrease her fear and to minimize the negative impact of fear on the fetus. Further studies are needed to evaluate the long-term effects of FOC on fetus.

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Conflicts of interest
There are no conflicts of interest.

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