

EVALUATION OF UTERINE ARTERY DOPPLER FINDINGS FOR PREGNANT WOMEN IN 3RD TRIMESTER WITH PELVIC GIRDLE PAIN

3. TRİMESTERDEKİ PELVİK KUŞAK AĞRISI OLAN GEBELERİN UTERİN ARTER DOPPLER BULGULARININ DEĞERLENDİRİLMESİ

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ABSTRACT

Objective: The aim of our study is to examine the changes in uterine artery Doppler flow of pregnant women with pelvic girdle pain compared to pregnant women without pelvic girdle pain.

Material-method: 54 volunteer pregnant women, who were in the third trimester of their pregnancy and applied to the Department of Gynecology and Obstetrics of Abant İzzet Baysal University Faculty of Medicine between April 2021 and August 2021, were included in the study. Two groups were defined as pregnant women with pelvic girdle pain (n=27) and pregnant women without pelvic girdle pain (n=27). Evaluation questionnaires including obstetric history, Visual Analog Scale (VAS), Pelvic Girdle Survey, sociocultural status, personal history, smoking use, alcohol use, previous operations and pain history were applied to both groups. In addition to evaluation questionnaires, Uterine Artery Doppler ultrasonography was applied to both groups. Systole/diastole (S/D) and Pulsatility Index (PI) of the two groups that underwent uterine artery Doppler ultrasonography were measured and recorded.

Results: It was found that the pregnant women with and without pelvic girdle pain participating in the study were similar in terms of age, height, body weight, gestational week, CV, education level, obstetric history, smoking, and occupation (p>0.05). Uterine artery S/D (p=0.006) was found to be significantly higher in the group with pelvic girdle pain than in pregnant women without pelvic girdle pain. There was no significant difference between the presence of bilateral notching (p = 0.096) and PI values (p= 0.051) in the uterine artery Doppler flow of pregnant women in both groups.

Conclusion: It was found that uterine artery Doppler S/D measurement was higher in pregnant women with pelvic girdle pain in the third trimester than in pregnant women without pelvic girdle pain.

Keywords: Doppler Ultrasonography, Uterine Artery, Pelvic Girdle Pain.

ÖZET

Amaç: Çalışmamızın amacı, pelvik kuşak ağrısı olan gebelerin pelvik kuşak ağrısı olmayan gebelere göre uterin arter doppler akımındaki değişiklikleri incelemektir.

Materyal- Method: Çalışmaya gebeliğinin üçüncü trimesterinde bulunan, Nisan 2021- Ağustos 2021 tarihleri arasında Abant İzzet Baysal Üniversitesi Tıp Fakültesi Kadın Hastalıkları ve Doğum bölümüne başvuran, 54 gönüllü gebe dâhil edildi. Pelvik kuşak ağrısı olan gebeler (n=27) ve pelvik kuşak ağrısı olmayan gebeler (n=27) olarak iki grup tanımlandı. Her iki gruba da değerlendirme anketleri ve uterin arter doppler ultrasonografisi uygulandı. Uterin arter doppler ultrasonografisi yapılan iki grubun sistol/diyastol (S/D) ve pulsatilite indeksi (PI) ölçülerek kaydedildi.

Bulgular: Çalışmaya katılan pelvik kuşak ağrısı olan ve olmayan gebelerin yaş, boy uzunluğu, vücut ağırlığı, gebelik haftası, özgeçmiş, eğitim düzeyi, obstetrik öykü, sigara kullanımı ve meslek açısından benzer olduğu bulundu (p>0,05). Pelvik kuşak ağrısı bulunan grupta uterin arter S/D (p=0,006), pelvik kuşak ağrısı olmayan gebelere göre anlamlı derecede yüksek bulundu.

Sonuç: Üçüncü trimesterde pelvik kuşak ağrısı olan gebelerde pelvik kuşak ağrısı olmayan gebelere göre uterin arter doppler S/D ölçümünün yüksek olduğu saptandı.

Anahtar Sözcükler: Doppler Ultrasonografi, Uterin Arter, Pelvik Kuşak Ağrısı.

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INTRODUCTION

During pregnancy, structural and physiological changes occur in the mother's body that affect all body systems in order to meet the needs of the baby (Caucasian, A. 2007; Tan, E.K. 2013). During pregnancy, a woman gains 11-15 kilograms in weight, blood volume increases, the fetus grows ventrally, causing a change in the body's center of gravity (Pritchard and Macdonald 1984; Paronavitana and Walker 2021). The resistance that occurs as a result of the spiral arteries continuing within the uterine muscle layer can be revealed by Doppler velocity flow evaluation through the uterine arteries (Aygün and Fehmi 2010). Doppler is an evaluation and dynamic measurement process that results from the detection of sound waves sent to moving formations at different frequencies. The resulting sound waves are generalized as systolic and diastolic components (Çelik et al., 2014). Thus, systole/diastole (S/D) and pulsatility index (PI) were defined. PI is calculated as maximum systolic velocity - minimum diastolic velocity / average velocity (Aygün and Fehmi 2010). Increased PI of the uterine artery and the presence of bilateral uterine artery nicking are associated with poor pregnancy outcomes (Ates et al., 2015). Pain during pregnancy may occur with circulatory disorders such as musculoskeletal changes and uterine blood circulation disorders (Akbayrak, T., Kaya, S. 2016; Fitzgerald, C.M., Segal N.A. 2015). Lumbar lordosis, pelvic anterior tilt, and thoracic kyphosis increase in pregnant women (Bullock, J.E. 1991; Marnach et al., 2003). Pelvic girdle; It is a closed osteoarticular structure consisting of the bone structure consisting of two coxa bones, sacrum, coccyx and two femurs, and the sacroiliac joints formed by them, sacrococcygeal joint, intercoccygeal joint, symphysis pubis and hip joints (Smith et al., 2008, Keriakos et al., 2011). Pelvic girdle pain (PGP) is a common problem that causes psychological and socioeconomic consequences (Bastiaanssen et al., 2005). PGP during pregnancy may occur due to increased load on the sacroiliac joint and changes in the skeletal muscle system and arteries feeding the organs. The reason for the increased interest in this issue in the last decade is the decrease in the quality of life and the increase in social costs caused by PGP (Wu et al., 2011).

To our knowledge, there is no study in the literature that specifically evaluates blood flow to the uterus in pregnant women with PGP. The aim of this study was to examine the uterine artery Doppler flow of pregnant women with PGP compared to pregnant women without PGP.

MATERIAL METHOD

Our study is a prospective study. The Ethics committee approval for this study was received from Abant İzzet Baysal University Faculty of Medicine Human Research Ethics Committee. (Decision No: 2021/177). The research was conducted between 27-40 years of age who applied to Abant İzzet Baysal University Faculty of Medicine, Department of Gynecology and Obstetrics between April and August 2021. 54 pregnant women at the gestational age were included.

The inclusion criteria were to be a 27th-40th weeks pregnant woman without a high-risk pregnancy, to volunteer to participate in the study, to be able to read and write Turkish, not to have any mental disorder prevent cooperation and understanding, and to be over 18 years of age.

Exclusion criteria were having hypertension during gestation, gestational diabetes and over diabetes, additional chronic diseases, musculoskeletal and neurological diseases, multiple gestations, cervical insufficiency, history of orthopedic surgery or trauma.

Evaluation questionnaires including obstetric history, sociocultural status, personal history, smoking use, alcohol use, previous operations and pain history were applied to both groups. Visual Analog Scale (VAS) and Pelvic Girdle Questionnaire (PGQ) were done after evaluation questionnaires. Bilateral uterine artery Doppler ultrasonography was performed.

The intensity of PGP experienced by pregnant women was measured with the VAS. Pregnant women participating this study were asked to mark the severity of their pain, such as back pain, abdominal pain and shoulder pain. The reason for evaluating the other region's pain is understanding if the pain isolated or general pain effecting whole body. VAS is a validated, subjective measure for acute and chronic pain. Scores are recorded by making a handwritten mark on a 10-cm line that represents a continuum between "No Pain" and "Worst Pain". It was explained that it corresponded to their statements and they were asked to mark the severity of their pain on the line (Fredy, 1923). The marked area was measured with a ruler on paper and the pain intensity of the individuals was recorded as cm.

During the examination, pregnant women with pain in the pelvic girdle area were identified. Individuals' PGP severity was evaluated using the PGQ. The PGQ was developed by Stuge et al in 2011 (Stuge et al., 2011). Turkish validity and reliability were determined by Yılmaz Yelvar et al. in 2019

(Yelvar et al., 2019). There are two subscales in the questionnaire: activity and symptoms. The questionnaire consists of 25 items in total, 20 items are related to activity and 5 items are related to symptoms. In the PGQ, items have multiple selections as corresponding to no problem = 0, some problem = 1, moderate problem = 2 and major problem = 3. An increase in the number in the scoring indicates an increase in the severity of PGP. When calculating the survey score, the marked points are added, divided by 75 and multiplied by 100, and the result shows the severity of pelvic pain. To find the subscales, the scores marked on the activity subscale are added up, divided by 60, and multiplied by 100 to find the activity subscale value. To calculate the symptom subscale, symptom subscale scores are summed, divided by 15 and multiplied by 100 (Starzec et al., 2019). The best score is given as 0, while the worst score is given as 100.

Uterine artery Doppler examination for pregnant women between 27-40 weeks was performed by the same clinician using transabdominal ultrasonography (Mindray DC 70). After the ultrasound probe was placed parallel to the inguinal ligament, the area where the uterine artery crossed the external iliac artery was detected with color Doppler imaging. At least three similar consecutive waves were monitored using pulsed wave Doppler. The insonation angle was kept below 50° and evaluable flows were recorded. Systole/diastole (S/D) was determined by automatically measuring the PI by the ultrasound device. The presence or absence of early diastolic notching was determined. The same procedure was repeated for the contralateral uterine artery and the data was recorded (Çelik et al., 2014).

In descriptive statistics, mean and standard deviation or median and minimum-maximum values were used for numerical variables, and number and percentage values were used for categorical variables. Kolmogorov-Smirnov test was used to assume normality. In comparison of the two groups, t-test or Mann Whitney u test was used for independent groups. Group comparisons in categorical variables were examined with the chi-square test. The significance level was taken as p<0.05. Considering the effect size w=0,778 thanks to effect size hypothesis between the two groups, it was determined that a study should be conducted with at least 54 people in total, with at least 27 in each group, with 80% power and 5% margin of error. Calculations were made with G-power 3.0.10 program.

RESULTS

There was no statistically significant difference in age, body weight, height, gestational week, education level, occupation, presence of chronic disease in the family, smoking, and previous surgery in pregnant women with PGP compared to pregnant women without PGP (p>0.05) (Table 1).

Table1. Pregnant Women's Age, Weight, Height, Gestational Age, Education Level, Occupation, Presence of Chronic Disease, Presence of Chronic Disease in The Family, Smoking, Previous Surgery

	X±SS with PGP	X±SS Without PGP	P value
Age (years)	30.0 ± 7.05	29.30 ± 5.83	0.676 ^a
Body weight (kilograms)	75.40 ± 7.77	75.46 ± 10.50	0.988 ^a
Height (cm)	162.70 ± 5.53	160.41 ± 6.17	0.156 ^a
	Median (Min-Max)	Median (Min-Max)	
Pregnancy week	35.0 (27 – 38)	32.0 (28 – 38)	0.312 ^c
Education level	(n=27)%	(n=27)%	
Primary education	4 (14.8)	4 (14.8)	0.354 ^b
Secondary school	8 (29.6)	7 (25.9)	
High school	9 (33.3)	7 (25.9)	
Associate degree	6 (22.2)	5 (18.5)	
Licence	0 (21.4)	4 (14.8)	
Have a Chronic Disease	0	0	
There is a chronic disease in the family	11 (40.7)	16 (59.3)	0.276 ^b
No chronic diseases in the family	16 (59.3)	11 (40.7)	
There is smoking	5 (18.5)	4 (14.8)	
No smoking	22 (81.5)	23 (85.2)	1,000 ^b
Pelvic Surgery History	1 (3.7)	0 (0.0)	1,000 ^b
Housewife	20 (74.1)	19 (70.4)	0.934 ^b
Officer	4 (14.8)	5 (18.5)	
Employee	3 (11.1)	3 (11.1)	

^at test in independent groups, ^c Mann-Whitney U test, X±SD: mean±standard deviation, ^b Chi-square test, % percentage, n=number

While the VAS value was 4.64 ± 2.0 in the group with PGP, the VAS value was 1.92 ± 1.62 in the group without PGP. There was a significant difference in VAS scores between those with and without PGP ($p < 0.001$). Those with PGP had higher VAS scores.

It was found that 53.6% of the group with PGP and 7.7% of the group without PGP had pain currently felt in any area of the body. The presence of pain that started before pregnancy was reported in 35.7% of the group with PGP, and the presence of pain that continued before pregnancy was reported in 23.1% of the group without PGP. In the comparison between the two groups, a significant difference was observed in the group with PGP compared to the group without PGP in terms of the presence of pain in any area of the body ($p < 0.05$). The average PGP severity of pregnant women according to PGQ was found to be 41.78 ± 18.45 .

A significant difference was found between pregnant women with and without PGP in terms of uterine Doppler SD scores ($p = 0.006$). Uterine Doppler SD scores of those with PGP were higher than the group without PGP. Uterine artery Doppler PI value ($p = 0.051$) was found to be similar between both groups. While the rate of bilateral uterine notching in pregnant women with PGP was 51.9%, it was 29.6% in those without PGP. There was no significant difference in bilateral uterine artery Doppler notching in pregnant women with PGP compared to pregnant women without PGP ($p = 0.097$) (Table 2).

Table 2. Uterine Artery Doppler Measurement in Pregnant Women

	Those with PGP X±SS	Without PGP X±SS	P value
Uterine artery S/D	13.42 ± 8.02	7.91 ± 5.67	0.006a
Uterine artery PI	9.99 (1.88 – 40.31)	7.54 (1.25 – 20.90)	0.051b
Bilateral uterine notching	n (%)	n (%)	P value
Yes	14 (51.9)	8 (29.6)	0.097
No	13(48.1)	19(70.4)	

SD: Systole/diastole ratio, t test in independent groups, X±SD: mean±standard deviation
 PI: Pulsatility index, b Mann-Whitney U test n=number, median (minimum-maximum)

DISCUSSION

In our study, uterine artery Doppler measurements of pregnant women with and without PGP in the third trimester were evaluated. An increase in S/D values was observed in the uterine artery Doppler flows of pregnant women with PGP compared to pregnant women without PGP. The presence of bilateral notching and PI value measurement were found to be similar in the group. In our study, no significant difference was observed in terms of age, body weight, height, and gestational age in pregnant patients with and without PGP.

In our study, it was observed that there was resistance in the uterine artery Doppler flow of pregnant women with PGP. Yayla et al. In their study in 1994, they evaluated the uterine artery mean systole/diastole (S/D) ratios of 48 cases with normal pregnancy findings and 62 cases with risky pregnancies. Uterine artery S/D ratios in risky pregnancies were found to be higher than in normal pregnancies. Yayla et al. compared normal pregnant women and risky pregnant women. In our study, high-risk pregnant women were excluded from the study. Yayla et al. unlike our study, which included pregnant women with PGP, the pregnant women were not compared in terms of risk (Yayla et al., 2021).

In their study with 185 pregnant women in 2015, Kayaoğlu et al. reported that pregnant women with increased uterine artery Doppler PI and RI resistance and bilateral uterine indentation had a risk of developing hypertension and preterm birth (Kayaoğlu et al., 2015). In our study, pregnant women with hypertension were excluded. Pregnant women were compared in terms of the pelvic girdle, but the week in which the pregnant women gave birth was not recorded. In common with our study, the Doppler findings observed in pregnant women who developed hypertension and gave birth prematurely are similar to the Doppler findings observed in pregnant women with PGP. Therefore, an increased risk of hypertension and premature birth can be predicted in pregnant women with PGP.

Celik et al. In their study in 2014, they reported that there was a significant negative correlation between both uterine artery Doppler findings and birth weight in 119 healthy pregnant women in the second trimester. They reported that as resistance in uterine artery Doppler flow increases, fetal birth

weight decreases (Çelik et al., 2014). In our study, pregnant women were compared in terms of the pelvic girdle, but their fetal birth weights were not recorded.

Yazıcı et al. In their study with 375 pregnant women in the second trimester in 2005, they found a significant relationship between the presence of early diastolic notching in uterine artery Doppler ultrasonography and the development of preeclampsia (Villa et al., 2012). In our study, risky patients were not included and their further follow-up was not given in the data. However, our result can be interpreted that pregnant women with PGP may be at risk for preeclampsia and poor obstetric outcomes.

Limitations of our study; Not including risky pregnancies, lack of further follow-up of pregnant women, and low number of patients are seen as reasons.

The strengths of our study are that it was firstly conducted on pregnant women with PGP, that the Doppler examination was performed by a single person, that pregnant women without risk were included in the study. The other causes of Doppler increase such as preeclampsia, hypertension, twin pregnancy explained as high-risk pregnancy were excluded in the study. In addition to high-risk pregnancy, the increase of uterine artery Doppler can cause negative effects on fetal growth. Despite the fact that causing negative effects on fetal growth, fetal growth and development ultrasonography data was not covered in this study.

CONCLUSION

A significant increase in uterine artery S/D was observed in pregnant women with PGP in the third trimester compared to pregnant women without PGP. Studies on this subject are limited and further studies are needed.

The increase of uterine artery Doppler flow measurement shows pelvic girdle pain in this study. The increase of uterine artery Doppler flow measurement causes negative effects on maternal and fetal health. In this study, women with high-risk pregnancy were excluded. Due to lack of studies indicating relations between pelvic girdle pain and uterine artery Doppler measurements, new studies to be evaluated for relations between high-risk pregnancy and the increase of uterine artery Doppler flow measurement findings.

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Conflict of interest

There is no conflict of interest.

Author Contributions

Plan and Design: N.E.A., M.A.T.; Data Collection: N.E.A., M.A.T.; Analysis and comments: N.E.A., N.Ö.; Review and check: N.E.A., N.Ö.; Writing: N.E.A.

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