Do the interactions between coital frequency, cervical length, and urogenital infection affect obstetric outcomes?

Koitus sıklığı, servikal uzunluk ve ürogenital enfeksiyonların etkileşimleri obstetrik sonuçları etkiler mi?

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Abstract

Objective: To determine whether interactions between coital frequency, cervical length, and urogenital infection affect obstetric outcomes.

Materials and Methods: A total of 268 unselected pregnant women were recruited in the study. The study population consisted of four groups of women: group 1 (n=203) screened negative for bacterial vaginosis (BV) both in the first and second trimesters; group 2 (n=18) screened negative for BV in the first trimester but positive in the second trimester; group 3 (n=33) screened positive for BV in the first trimester but negative in the second trimester; and group 4 (n=14) screened positive for BV both in the first and second trimesters. Urine culture, cervico-vaginal cultures, and bacterial vaginosis were screened between 11-14 weeks and 20-24 weeks.

Results: Two hundred fifty women were eligible for analysis in the study after lost-to-follow up patients were excluded. Previous abortion ≥1 and previous preterm delivery at 24-34 weeks ≥1 were statistically significantly higher in group 2. The number of patients who were diagnosed as having preterm premature rupture of membranes (PPROM) was statistically significantly higher in group 4. Sexual intercourse during the first trimester, cervical length during the second trimester, and history of preterm birth (PTB) were statistically significant risk factors for preterm birth <37 weeks (1.27; (1.12-1.44); 5.33; (1.84-15.41); 6.95; (1.58-30.54), respectively).

Conclusion: Presence or treatment of BV did not influence rates of PTB. The probability of PPROM would be higher in patients who are BV positive both in the first and second trimesters. J Turk Soc Obstet Gynecol 2015;2:66-70

Key Words: Preterm birth, urogenital infection, bacterial vaginosis, cervical length, coital frequency

Özet

Amaç: Koitus sıklığı, serviks uzunluğunu ve ürogenital enfeksiyon varlığı ve değişkenlerin etkileşimlerinin obstetrik sonuçlara etkileri.

Gereç ve Yöntemler: Çalışmamızda 268 gebe kadın dahil edildi. Dört gruba ayrıldı; grup 1 (n=203) hem ilk hem ikinci trimesterde bakteriyel vajinoz (BV) taramasında negatif, grup 2 (n=18) ilk trimesterde negatif, ikinci trimesterde pozitif, grup 3 (n=33) ilk trimesterde pozitif, ikinci trimesterde negatif, grup 4 (n=14) her iki trimesterde pozitif çıkan hastalarдан oluşturuldu. İdrar kültürleri, servik-servikal kültürler ve bakteriyel vajinoz taraması sırasında 11-14 haftada ve 20-24 haftada değerlendirildi.

Bulgular: 250 kadın analiz edilmiştir. Abortus sayısı ≥1 ve 24.-34. haftalar arası preterm doğumu ≥1 olan hastalar grup 2’de istatistiksel olarak daha fazla. Preterm premature rupture of membranes (PPROM) sayısı grup 4’te istatistiksel olarak daha fazla. İlk trimesterde cinsel ilişki, ikinci trimesterde ölçülen servikal uzunluk ve preterm doğum öyküsü sırasıyla istatistiksel olarak preterm doğum için önemli risk faktörleri olarak değerlendirildi (1.27; (1.12-1.44); 5.33; (1.84-15.41); 6.95; (1.58-30.54), sırasıyla).

Sonuç: BV varlığı veya tedavisi PTB oranını etkilememektedir. Premature premature rupture of membranes (PPROM) riski daha yüksek olan hastalarda BV pozitif olma olasılığı daha yüksektir. İlk trimesterde cinsel ilişki, ikinci trimesterde ölçülen servikal uzunluk ve preterm doğum öyküsü preterm doğum oranını etkileyen değişkenlerdir. J Turk Soc Obstet Gynecol 2015;2:66-70

Anahtar Kelimeler: Preterm doğum, ürogenital enfeksiyon, bakteriyel vajinoz, servikal uzunluk, koitus sıklığı

Introduction

Preterm birth (PTB) has been defined as birth before 37 weeks of gestation and is the leading cause of neonatal mortality and morbidity(1). PTB can be divided into spontaneous or induced for maternal and fetal indications. There are multiple etiologic factors that may result in spontaneous preterm birth, including

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genital tract infections(2). The mechanism responsible for PTB in pregnant women with genital tract infections might be ascending bacteria from the vagina to the chorioamniotic membranes and amniotic fluid(3). Among the microorganisms responsible for genital tract infections, bacterial vaginosis is the most commonly-associated microorganism-related clinical entity(4). The prevalence of BV has been reported to be 50% in pregnant women and 15-30% in non-pregnant women(5,6). It is hard to investigate to the real prevalence and reported prevalence covers a wide range because most of cases of BV are asymptomatic and the populations that have been investigated were highly selected groups.

The effect of coitus on the outcome of pregnancies remains inconclusive. Some studies have reported no relationship with coital activity and PTB(7,8). Read et al. reported no association between frequent sexual intercourse and PTB, but contrary to previous authors, they reported an increased risk of PTB in the presence of microorganisms(9).

Either prostaglandin in semen might have a direct effect on the cervix, or coital activity might influence bacterial colonization and result in PTB(10).

Cervical length assessment via ultrasound can be performed for the prediction of PTB in the first and/or second trimesters(11). Evaluation of cervical length in patients with a history of PTB or in asymptomatic patients might have small differences(12). It is not yet clear whether the presence or absence of a vaginal microorganism might have effects on cervical shortening.

In our study, we aimed to determine whether interactions between coital frequency, cervical length, and urogenital infection affected obstetric outcomes.

**Materials and Methods**

A total of 268 unselected pregnant women who were admitted to the obstetrics unit of a tertiary center at at Kocaeli University between July 2007 and September 2011 were invited to participate in the study. The general PTB rate was 12.7%(13). The sample size needed to recruit was calculated as 1.962*pq/d2 with a 95% probability to predict this prevalence (1.962*0.1*0.9/0.052=140). The minimum number of patients to be recruited for the study was 140 according to the formula and we recruited 250 patients. Two hundred fifty women were eligible for analysis in the study after the lost-to-follow-up patients were excluded. The local ethics committee approved the study. Written informed consent was obtained from all the patients who participated in the study.

In this study, the primary outcome measure was to determine whether interactions between coital frequency, cervical length, and urogenital infection affected obstetric outcomes.

Criteria for enrollment included all the healthy pregnant women who were admitted during the first trimester. Exclusion criteria included: 1) multifetal pregnancy, 2) intrauterine fetal death, 3) fetal abnormality, and 4) systemic maternal disease. Women with a prior PTB were not excluded from the study.

After patients were evaluated according to the inclusion and exclusion criteria, a total of 268 patients were investigated. The study population consisted of four groups of women: women who screened negative for bacterial vaginosis both in the first and second trimesters; (group 1; n=203), those who screened positive for bacterial vaginosis both in the first and second trimesters but positive in the second trimester (group 2; n=18), those who screened positive for bacterial vaginosis in the first trimester but negative in the second trimester (group 3; n=33); and those who screened positive for bacterial vaginosis both in the first and second trimesters (group 4; n=14). Data analysis was performed after excluding patients who were lost-to-follow-up (6 patients in group 1, five patients in group 2, four patients in group 3, and three patients in group 4).

All patients underwent gynecologic examination with a sterile speculum and were investigated for vaginal discharge. Urine culture, cervico-vaginal cultures, and bacterial vaginosis were screened between 11-14 weeks and 20-24 weeks. A polyester swab taken from the junction of the upper third and lower two thirds of the lateral vaginal wall was rolled on a glass slide. The slides were Gram stained and interpreted in accordance with the criteria of Nugent et al.(14). Bacterial vaginosis was diagnosed if the Gram stain score was 7 to 10. Control vaginal samples were obtained one week after completion of the therapy. Patients with bacterial vaginosis were treated with ornidazole 500 mg for 5 days (Ornisid, Abdi İbrahim, Turkey). Vaginal swabs were directly inoculated onto Sabouraud dextrose agar (SDA) plates (Oxoid), which were incubated at 37 °C for 48 h to isolate *Candida spp.* All strains of *Candida spp.* were identified based on the germ tube test, and morphologic characteristics on Cornmeal Tween-80 agar and API 20C AUX system (BioMerieux).

Ultrasonographic examinations were performed with (Medison Sonoca 8x Ultrasound Machine, Inc., 4-8 MHz) a transvaginal probe. A single specialist (EC) performed the measurements in order to eliminate the possibility for interobserver variability in measurement technique. The specialist was blinded to the women’s previous cervical length records. After the patient emptied her bladder, she was placed in the lithotomy position. Transvaginal ultrasonographic measurements of the cervix were made with a standard technique, as previously described by lams et al.(15). The internal cervical os was identified using a sagittal plane view, and the calipers were placed at the furthest points between the internal and external cervical os. When funneling was present, we measured the distance over which the endocervical walls were juxtaposed. Three measurements were recorded for each and the shortest measurements were used. According to the trial protocol, cervical length was measured first at 11-14 weeks corresponding to routine first trimester nuchal translucency screening, the second was at 18-20 weeks corresponding to the triple test and abnormality screening, and lastly at 28-32 weeks of gestation.

The statistical analysis of the data was performed using the Statistical Package for Social Sciences for Windows (SPSS,
Chicago, IL, USA). Results were reported as mean ± standard deviation and percentages. Chi-square test was used to compare categorical variables. Student’s T-test was used for comparing continuous variables. Binary logistic regression analysis first with Enter and then with forward Wald methods were used to determine risk factors of PTB (<37 weeks of gestation) as a dichotomous outcome variable. The equation was calculated by independent continuous variables such as mean coital frequency/week between admission to 14 weeks, mean coital frequency/week between 14 weeks to 28 weeks and categorical variables such as cervical length ≥30 mm or <30 mm at 11-14 weeks, cervical length ≥30 mm or <30 mm at 18-20 weeks, presence or absence of an urinary infection in the first and second trimesters, vaginal symptoms in the first and second trimesters, candidal infection in the first and second trimesters, bacterial vaginosis in the first and second trimesters.

**Table 1.** Maternal variables according to the groups (values are n, mean (± standard deviation) or n/N (%)).

| Variable                        | Group 1 (n=197) | Group 2 (n=13) | Group 3 (n=29) | Group 4 (n=11) | p   |
|---------------------------------|-----------------|----------------|----------------|----------------|-----|
| Maternal age (years)            | 27.2±4.2        | 37.2±6.3       | 25.7±4.2       | 27.8±5.9       | 0.12|
| Primigravidity                  | 103 (52.3)      | 5 (38.5)       | 12 (41.4)      | 6 (54.5)       | 0.56|
| Previous abortion ≥1            | 24 (12.2)       | 5 (38.5)       | 5 (17.2)       | 0              | 0.03*|
| Previous preterm delivery at 24-34 weeks ≥1 (n) | 6 (3.0)        | 1 (7.7)        | 4 (3.8)        | 0              | 0.05|
| Number of smokers during pregnancy | 12 (6.1)  | 2 (15.4)   | 1 (3.4)        | 1 (9.1)        | 0.25|
| Coital frequency (week)         |                 |                |                |                |     |
| 1st trimester                   | 2.6±2.3         | 1.9±2.3        | 3.8±3.3        | 4.3±4.4        | 0.77|
| 2nd trimester                   | 2.7±2.6         | 2.4±1.8        | 3.6±2.1        | 4.0±2.0        | 0.75|
| 3rd trimester                   | 2.0±2.3         | 2.0±2.6        | 2.7±1.4        | 3.5±1.8        | 0.26|
| Cervical length (mm)            |                 |                |                |                |     |
| 1st trimester                   | 37.2±6.3        | 36.3±5.7       | 37.2±7.5       | 35.3±6.9       | 0.24|
| 2nd trimester                   | 36.1±6.3        | 36.7±4.2       | 35.7±8.2       | 34.1±6.3       | 0.14|
| 3rd trimester                   | 34.1±6.8        | 34.0±3.9       | 34.7±8.6       | 30.0±7.6       | 0.88|
| Urinary infection (n)           |                 |                |                |                |     |
| 1st trimester                   | 7 (3.6)         | 0              | 4 (13.8)       | 0              | 0.06|
| 2nd trimester                   | 3 (1.5)         | 0              | 1 (3.4)        | 1 (9.1)        | 0.30|
| 3rd trimester                   | 5 (2.5)         | 0              | 0              | 0              | 0.71|
| Candida positivity              |                 |                |                |                |     |
| 1st trimester                   | 8 (4.1)         | 1 (7.7)        | 2 (6.9)        | 3 (27.3)       | 0.09|
| 2nd trimester                   | 3 (1.5)         | 0              | 0              | 0              | 0.69|
| 3rd trimester                   | 3 (1.5)         | 2 (15.4)       | 3 (10.3)       | 3 (27.3)       | 0.001|

*p<0.05, statistically significant.

**Table 2.** Maternal and fetal variables according to data of women who were screened negative for bacterial vaginosis both in the first and second trimesters shortened as (-/-) for group 1, group 2 (-/+), group 3 (+/-) and group 4 (+/+)(values are n, mean (± standard deviation) or n/N (%)).

| Variable                        | Group 1 (n=197) | Group 2 (n=13) | Group 3 (n=29) | Group 4 (n=11) | p   |
|---------------------------------|-----------------|----------------|----------------|----------------|-----|
| Gestational age at delivery     | 38.5±2.1        | 39.0±1.1       | 38.1±3.0       | 38.1±2.2       | 0.155|
| PPROM                           | 17 (8.6)        | 1 (7.6)        | 4 (13.7)       | 5 (45.4)       | 0.03*|
| Birth weight (g)                | 3307±4792.3     | 3461±260       | 3011±666       | 3124±433       | 0.015|
| Delivery <37 weeks of gestation n (%) | 18 (9.1)   | 0              | 5 (17.2)       | 3 (27.3)       | 0.08|
| APGAR<7 1 min (n, %)            | 2 (1.0)         | 0              | 1 (3.4)        | 0              | 0.61|
| APGAR<5 min (n, %)              | 1 (0.5)         | 0              | 0              | 0              | 0.97|
| NICU Admission                  | 5 (3.4)         | 0 (0)          | 4 (16.7)       | 1 (11.1)       | 0.04*|
| Respiratory Distress Syndrome   | 0               | 0              | 0              | 0              | 1   |
| Neonatal Sepsis                 | 0               | 0              | 0              | 0              | 1   |

*p<0.05, statistically significant. PPROM: Preterm premature rupture of membranes, NICU: Neonatal intensive care unit.
and history of presence of PTB. Statistical significance was considered p values less than 0.05.

Results

From a total of 268 women, after lost-to-follow-up patients were excluded, 250 were eligible for analysis in the study. Selected variables according to the groups are presented in Table 1. Previous variables according to the groups are presented in Table 3. Sexual intercourse during the first trimester, cervical

| Table 3. The linear regression model for predictors of Preterm birth <37 weeks of gestation |
|----------------------------------|-----------------|-----------------|
|                                  | OR              | Confidence interval | p   |
| **First trimester**              |                 |                   |     |
| Sexual intercourse/week          | 1.27            | 1.12-1.44         | <0.001* |
| Urinary infection                | 0.860           |                   |     |
| Vaginal symptoms                 | 0.126           |                   |     |
| Candida positivity               | 0.320           |                   |     |
| Nugent score                     | 0.091           |                   |     |
| Cervical length (mm)             | 0.393           |                   |     |
| **Second trimester**             |                 |                   |     |
| Sexual intercourse/week          | 0.070           |                   |     |
| Urinary infection                | 0.346           |                   |     |
| Vaginal symptoms                 | 0.351           |                   |     |
| Candida positivity               | 0.733           |                   |     |
| Nugent score                     | 0.290           |                   |     |
| Cervical length (mm)             | 5.33            | 1.84-15.41        | 0.002* |
| History of preterm birth         | 6.95            | 1.58-30.34        | 0.010* |

* p<0.05, statistically significant. (Independent variables: sexual intercourse, urinary infection, vaginal symptoms, candidal infection, Nugent score, and cervical length during first and second trimesters)

Length during the second trimester and history of PTB were statistically significant risk factors for PTB <37 weeks.

Discussion

In the present study, we assessed the presence of bacterial vaginosis in the first and second trimesters of pregnancy and evaluated the effects and associations of BV, cervical length, and coital frequency on PTB. A strong positive correlation was defined between BV and PTB. A comparison between the groups and the analysis revealed statistically significantly higher number of admissions in groups 2 and 4 when compared with other groups.

Maternal and fetal variables according to the groups are shown in Table 2. The number of patients who were diagnosed as having preterm premature rupture of membranes (PPROM) was statistically significantly higher in group 4 when compared with other groups. When birth weight of newborns was compared between the groups, it was statistically significantly higher in groups 2 and 4 when compared with other groups.

The risk factors for PTB <37 weeks of gestation are demonstrated on Table 3. Sexual intercourse during the first trimester, cervical length during the second trimester and history of PTB were statistically significant risk factors for PTB <37 weeks.
trimesters in all the groups were not statistically significantly different. Logistic regression analysis revealed a statistically significant effect of cervical length measurement on PTB. Effect of coitus on PTB has been investigated in the literature. Kurki et al. investigated the association of coitus, bacterial vaginosis, and PTB(7). They concluded that coitus during pregnancy increased neither bacterial vaginosis nor PTB. Similarly, Yost et al. researched the effect of coitus in early pregnancy on PTB and reported no association between the two parameters(8). Read et al. reported no association between frequent sexual intercourse and PTB, but contrary to previous authors, they reported an increased risk of PTB in the presence of microorganisms(9). In our study, coital frequency had no influence on BV in all groups in all trimesters. Also, only coital frequency in the first trimester was associated with an increased risk of PTB in the regression analysis model, but coital frequency in the second trimester was not associated with an increased risk of PTB. Our results indicated no effect of coitus on PTB after the first trimester.

In conclusion, our results revealed that presence of or treatment of BV did not influence rates of PTB. The probability of PPROM would be higher in patients with BV positive both in the first and second trimesters. Coital frequency in the first trimester, cervical length in the second trimester, and history of PTB are variables that may affect rates of PTB.

**Ethics Committee Approval:** It was taken.

**Informed Consent:** It was taken.

**Concept:** Eray Çalışkan

**Design:** Yiğit Çakıroğlu

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**Analysis or Interpretation:** Eray Çalışkan, Yiğit Çakıroğlu, Seyda Çalışkan

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