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Original Article

The Relationship between Mid-trimester Cervical Length and Pre-term Delivery and Maternal Characteristics

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Keywords: Cervical length; pregnancy; preterm birth; ultrasonography.

ABSTRACT

Objective: The study aimed to investigate the relationship between mid-trimester cervical length and pre-term delivery and maternal characteristics.

Methods: Cervical length measurement was carried out in 98 pregnant women who presented to antenatal outpatient clinic between 20 and 24th weeks' pregnancy. Age, obstetric history, gravida, parity, the number of abortion, and body mass index (BMI) were also recorded. Births before 37th week formed preterm birth group, and those after 37th week formed term birth group.

Results: Of pregnant women included in the study, 77 (78.6%) gave birth after 37th week of pregnancy, while 21(21.4%) gave birth before 37th week of pregnancy. Fourteen cases (14.3%) with cervical length under 25 mm, while 84 (85.7%) cases with cervical length over 25 mm. Twelve (12.24%) of the study group had a history of preterm birth. Of these cases, 11 (91.7%) had a recurrent pre-term birth. The rate of pre-term birth was higher in cases with a cervical length less than 25 mm compared to other cases ($p<0.05$). There was a significant relation between cervical length and age and BMI levels ($p<0.05$). No significant relation was found between parity and term and pre-term births ($p>0.05$). There was a significant relation between BMI and term and pre-term birth rates ($p<0.01$). The rate of pre-term birth was significantly higher in cases with previous history of pre-term birth ($p<0.05$).

Conclusion: Mid-trimester short cervical length associated with presence of funneling, history of preterm birth, and obesity. Both a history of pre-term birth and a short cervix were associated with preterm birth. Therefore, in this patient group, routine cervical length measurement at 20–24 pregnancy weeks is recommended.

INTRODUCTION

Pre-term birth is defined as any birth between 20 and 37 weeks of pregnancy and accounts for about 7%–12% of all births.[1] Pre-term birth is one of the significant causes of neonatal morbidity and mortality. Pathophysiological mechanisms which may trigger pre-term birth remain unclear. Race, low socioeconomic status, uterine anomalies, and cervical interventions such as cervical conization, conditions leading to the uterine distension, such as multiple pregnancies and polyhydramniosis increase the risk of pre=term birth.[2-5] The risk of pre-term birth increases as the number of pre-term births increases.[6,7]

The differences in internal OS can be recognized by ultrasonographic evaluation. Shorter cervical length and funneling in the cervical canal are the most important ultrasono-

graphic findings for preterm labor.[8,9] For the prediction of pre-term labor, many studies have been performed on biochemical markers such asinterleukin-6, AFP (alpha-fetoprotein), C-reactive protein, ferritin, Intercellular Adhesion Molecule 1, and alkaline phosphatase levels. It is known that the combination of biochemical parameters with ultrasonographic findings may increase the sensitivity in predicting the risk of pre-term birth.[10,11]

There are limited data on the etiology of preterm birth. Thus, theaim of the present studywas to investigate the relationship between mid-trimester cervical length and pre-term birth, maternal characteristics, and obstetric history.

MATERIALS AND METHODS

A total of 98 pregnant women who attended the outpatient clinic for routine antenatal follow-up between January 2008 and 2009 were included in the present study. The study was in accordance with the tenets of the Declaration of Helsinki and was approved by the Ethics Committee of the University of Health Sciences Turkey, Kartal Lütfi Kırdar City Hospital (Approval number: 2022/514/224/21, April 27, 2022). Pregnant women with multiple pregnancies, fetal anomaly, placenta previa, Mullerian anomaly, myoma uteri, and cervical insufficiency and those who underwent cerclage were excluded from the study. Age, body mass index (BMI), pregnancy and birth weeks, gravida, parity, and abortion, and the number of cases included in the study were recorded.

Pre-term birth is defined as births occurring before 37 weeks; this classification includes extremely preterm (<28 weeks), very pre-term (28–32 weeks), or moderate to late preterm (32–37 weeks). Fetal biometric measurements were carried out with transabdominal ultrasonography to confirm the week of pregnancy. For those who do not remember the date of their last menstrual period, early pregnancy ultrasonography measurements were used to determine the week of pregnancy. The cervical length was measured by the same physician using transvaginal ultrasonography (Logic 500, GE Medical Systems, USA). All ultrasound measurements were performed according to standard protocol: Patients were examined in a dorsal lithotomy position with an empty urinary bladder. A vaginal probe was gently advanced into the vagina, thus, there was no pressure on the cervix. A sagittal plane was obtained where internal OS, external OS, and cervical canal were visible. The image was magnified to cover 75% of

Table 1. Maternal versus clinical characteristics of the study population

Characteristics	Mean±SD
Age (year)	26.54±5.89
BMI (kg/m^2)	24.93±3.75
Cervical length (mm)	35.82±7.66
Gestational age at measurement (week)	22.95±0.81
Gestational age at delivery (week)	37.86±2.32
Gravida	2.33±1.33
Parity	0.87±0.95
Abortion	0.32±0.58

Mean±SE values were used for statistical analysis. BMI: Body mass index, SE: Standard error, SD: Standard deviation.

Table 2. Evaluation of clinical and sociodemographic characteristics according to cervical length

Variables	Cervical length (mm)		Total	p***
	≤25, n (%)	>25, n (%)		
Gravida	3.28±1.54	2.17±1.24	2.33±1.33	0.009**
Abortus	0.71±0.91	0.26±0.49	0.32±0.58	0.029*
Age (year)				
≤20	4 (28.6)	10 (11.9)	14 (14.3)	0.026*
21–34	6 (42.9)	65 (77.4)	71 (72.4)	
≥35	4 (28.6)	9 (10.7)	13 (13.3)	
BMI (kg/m^2)				
<20	4 (28.6)	4 (4.8)	8 (8.2)	0.011*
20–29	9 (64.3)	72 (85.7)	81 (82.7)	
≥30	1 (7.1)	8 (9.5)	9 (9.2)	
Time of birth				
Pre-term	13 (92.9)	8 (9.5)	21 (21.4)	0.001**
Term	1 (7.1)	76 (90.5)	77 (78.6)	
Funneling				
Present	3 (21.4)	1 (1.2)	4 (4.1)	0.009**
Absent	11 (78.6)	83 (98.8)	94 (95.9)	

*p<0.05; **p<0.01; ***Obtained by Fisher's exact test. BMI: Body mass ındex.

the screen. In the section, the distance between internal and external OS was measured. If the distance was not on a single line, separate linear measurements were added to calculate cervical length. Three measurements were made on each pregnant woman. The shortest measurement was accepted as cervical length. Cut-off value for the short cervix was considered as ≤25 mm or if funneling was present. The data were retrieved from hospital's electronic database and contacted by phone.

Data were analyzed using NCSS 2007&PASS 2008 Statistical Software (Utah, USA). Descriptive statistical methods (mean, standard deviation, median, and frequency) were used. Mann–Whitney U test was used in the comparison of parameters not normally distributed between groups. The Chi-square test was utilized in the comparison of qualitative data. Results were evaluated with a 95% confidence interval, and $p<0.05$ was considered statistically significant.

RESULTS

A total of 98 pregnant women who attended the antenatal outpatient clinics between 20 and 24th of gestational weeks between January 2008 and 2009 were included in the present study. Demographic characteristics of cases are shown in Table 1.

A total of 98 cases were identified, including 14 cases (14.3%) with a cervical length of ≤25 mm and 84 cases (85.7%) with a cervical length of >25 mm. The total number of preterm births was 21 (21.4%). The characteristics of the patients according to the cervical length are shown in Table 2.

There was no significant relationship between gestational week and term and pre-term birth rates in nulliparous and multiparous cases. The relationship between parity and timing of birth and cervical length is demonstrated in Table 3.

The rate of pre-term birth was significantly higher in cases with a previous history of pre-term birth ($p<0.05$). The relation between obstetrical history and term and pre-term birth is demonstrated in Table 4.

DISCUSSION

Preterm birth is one of the leading causes of perinatal morbidity and mortality. Although significant improvement has been observed in neonatal survival with the advances in the care of premature infants, there was no significant decrease in the rate of pre-term birth.[12] The present study investigated the factors that may affect cervical length at 20–24th weeks of gestation and maternal characteristics and obstetrics history.

Pregnant women with a history of pre-term birth have a higher risk of recurrent pre-term birth in subsequent pregnancies.[13,14] The recurrence risk of pre-term birth after a single pre-term birth history is 10–30%. However, as the number of pre-term births increases, so does the risk of recurrence.[15] A retrospective study by Laughon et al. involving 51.086 pregnant women reported that 3.836

Table 3. Evaluation of timing of birth and cervical length according to parity

Variables	Parity		Total	p***
	Nulliparous (n=41), n (%)	Multiparous (n=57), n (%)		
Pregnancy week				
Pre-term	7 (17.1)	14 (24.4)	21 (21.4)	0.373
Term	34 (82.9)	43 (75.4)	77 (78.6)	
Cervical length (mm)				
≤25	2 (4.9)	12 (21.1)	14 (14.3)	0.024*
>25	39 (95.1)	45 (78.9)	84 (85.7)	

*p<0.05; **p<0.01; ***Obtained by Fisher's exact test.

Table 4. The relationship between obstetric history and term and pre-term birth

Obstetric history	Cervical length (mm)	Pregnancy week		Total, n (%)	p-value*
		Preterm, n (%)	Term, n (%)		
Present	≤25	11 (100)	0	11 (91.7)	0.035*
	>25	0	1 (100)	1 (8.3)	
Absent	≤25	2 (20.0)	1 (1.3)	3 (3.5)	0.083
	>25	8 (80.0)	75 (98.7)	83 (96.5)	

*P<0.05; **P<0.01; ***Obtained by Fisher's exact test. The column percentage is given.

women (7.6%) had a preterm birth. Of these women, 1160 (30.7%) also had preterm birth in their second pregnancies. In the meta-analysis conducted by Phillips et al.[16] including 55.197 pregnant women who had a history of preterm birth had a recurrence risk of preterm birth was found to be 30%. Of these cases, 7% were associated with preterm premature rupture of membranes and 23% with a history of preterm labor. Similarly, 12 (12.24%) of the study group had a history of pre-term birth. Of these cases, 11 (91.7%) had recurrent pre-term birth.

The measurement of cervical length is an important parameter for determining the risk of pre-term birth in singleton and multiple pregnancies. Transvaginal ultrasonographic examination performed between 18 and 32 weeks of pregnancy showed that the risk of pre-term birth increased as the cervical length shortened.[17] According to The American College of Obstetricians and Gynecologists, in those with <34 weeks of pre-term birth history ≤25 mm, and in those without a history ≤20 mm is considered short cervical length.[18] In the literature review, the sensitivity of ≤25 mm cervical length in predicting pre-term birth varies between 6% and 76%, depending on the population examined and methodological differences between studies.[19] In the study of Ermiş et al.[20] on 390 singleton pregnancies at 20–24 weeks gestation, the mean cervical length was 42.45±8.8 mm. The researchers used 28 mm as the cut-off value for short cervical length. They found that the sensitivity and specificity of the cervical length of 28 mm in predicting pre-term births were 24.1% and 97%, respectively. Similarly, in our study, the rate of pre-term birth was found to be higher in cases with a cervical length <25 mm compared to other cases ($p<0.05$).

Funneling is a protrusion of amniotic membranes toward the cervical canal. It seems to be a common in the presence of a short cervical length in high-risk women. However, its occurrence is usually associated with the contraction of the lower uterine segment and has no clinical significance.[21,22] In the present study, the rate of funneling was found as 4.1%, and the rate of funneling was significantly higher in cases with short cervical length ($p<0.05$). These results reflect those of Mancuso et al. who also found that a V-shaped funnel is associated with short cervix, and a U-shaped funnel has clinical implications for pre-term delivery in high-risk women with a previous spontaneous pre-term delivery and a short cervix.[23]

It is well-known that the risk of pre-term birth increases at advanced ages and in adolescent mothers. The study by Fuchs et al.[24] investigating the effect of maternal age on pre-term birth stated that the risk of pre-term birth increases over the age of 40, and the lowest risk was between the ages of 30–34. Fraser et al.[25] found an increased risk of adverse pregnancy outcomes, particularly preterm birth, in young mothers, particularly those under 17 years of age. Another study showed a significant difference between pregnant women under the age of 16 years and those aged between 16 and 19 years of age.[19] In the present study, there were 14 (14.3%) pregnant women under the age of 20 and 13 (13.3%) pregnant women over the age of 35. Among these women, there was a significant relationship between age and short cervical length.

Although there were many conflicting studies reporting that high or low BMI was associated with preterm birth, it was usually medical complications that led to this condition.[26,27] In the present study, the rate of pre-term birth was found to be higher in cases with BMI under 20 kg/m^2. Similarly, a systematic review and meta-analyses by Han et al. reported that singletons born to underweight women have higher risks of pre-term birth delivery and low-birth weight than those born to normal weight women.[28] On the other hand, a study investigating maternal obesity and the risk of pre-term delivery involving 1,599,551 deliveries in Sweden showed that[6] maternal overweight and obesity during pregnancy were associated with increased risks of pre-term delivery, especially extremely pre-term delivery.[29] More broadly, research is also needed to determine the link between BMI and pre-term birth.

Palma-Dias et al.[13] stated that cervical length was significantly different between primiparous and multiparous women. The researchers noted that the difference decreased when the adolescent age group was excluded from the final analysis. Our study found no significant relationship between gestational week and term and pre-term birth rates in nulliparous and multiparous cases.

Saccone et al.[30] emphasized that the risk of pre-term birth increased in those with a history of surgical uterine evacuation, and the risk did not change in the group that underwent medical termination. In our research, although surgical uterine evacuation and medical termination were not differentiated in those with a history of abortion, the number of miscarriages was found to be significantly higher in the group with short cervical length.

In conclusion, the mid-trimester short cervical length associated with presence of funneling, history of pre-term birth, and obesity. Both a history of pre-term birth and a short cervix were associated with pre-term birth. Therefore, it is recommended that routine cervical length measurement be made during 20–24 weeks of pregnancy in this patient group.

Ethics Committee Approval

This study approved by the Kartal Lütfi Kırdar City Hospital Clinical Research Ethics Committee (Date: 27.04.2022, Decision No: 2022/514/2241/21).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: P.Y., R.A.B.; Design: P.Y., R.A.B.; Supervision: G.Y., R.A., R.B.B., A.K.; Materials: R.A., E.K., G.Y., E.M., K.K.; Data: P.Y., R.A., E.K., A.E., P.B., A.K.; Analysis: G.Y., E.M., R.B.B., Ö.K., A.E., P.B; Literature search: K.K., R.B.B.,

Ö.K., A.E., P.B., A.K.; Writing: P.Y., R.A., E.K., G.Y., E.M., K.K., R.B.B., Ö.K., A.E., P.B., A.K.; Critical revision: P.Y., R.A., E.K., G.Y., E.M., K.K., R.B.B., Ö.K., A.E., P.B., A.K.

Conflict of Interest

None declared.

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Mid-Trimester Servikal Uzunluk ile Erken Doğum ve Maternal Özellikleri Arasındaki İlişkinin Değerlendirilmesi

Amaç: Bu çalışmanın amacı 2. trimesterdaki servikal uzunluk ile preterm doğum ve maternal özellikler arasındaki ilişki değerlendirmektir.

Gereç ve Yöntem: Çalışmaya, hastanemiz antenatal polikliniğine 20-24. gebelik haftalarında başvuran servikal uzunluk ölçümü yapılan 98 gebe çalışmaya dahil edildi. Yaş, vücut kitle indeksi (VKİ), obstetrik öykü, gravida, parite ve abort sayıları kaydedildi. Preterm doğum grubu 37. gestasyonel hafta öncesi doğum, term doğum grubu 37. gestesyonel hafta sonrası doğum olarak tanımlandı.

Bulgular: Çalışma grubunda 77 (%78.6) gebe 37. gebelik haftasından sonra 21 (%21.4) gebe ise 37. gebelik haftası öncesinde doğum yaptı. Servikal uzunluk 14 (%14.3) hastada 25 mm'den kısa, 84 (%85.7) hastada ise 25 mm'den uzun olarak tespit edildi. On iki (%12.24) hastamızda preterm doğum öyküsü mevcuttu. Preterm doğum oranı servikal uzunluğu 25 mm'den kısa olan grupta anlamlı olarak yüksek bulundu ($p<0.05$). Yaş, VKİ seviyeleri ile servikal uzunluk arasında anlamlı ilişki tespit edildi ($p<0.05$). Preterm/term doğum ve parite sayısı arasında ilişki tespit edilemedi ($p<0.05$). Preterm ve term doğum oranları ile VKİ arasında anlamlı ilişki tespit edildi ($p<0.05$). Preterm doğum öyküsü varlığında preterm doğum oranı anlamlı olarak artmaktadır ($p<0.05$).

Sonuç: Servikal hunileşme, preterm doğum öyküsü ve obezite varlığı 2. trimester servikal uzunluğunun kısa olması ile ilişkili tespit edildi. Bu nedenle bu hasta gruplarında 20-24. gebelik haftalarında rutin servikal uzunluk ölçümü yapılması önerilmektedir.

Anahtar Sözcükler: Gebelik; preterm doğum; servikal uzunluk; ultrasonografi.