Original Article

Cervical Assessment by Ultrasound for Predicting Preterm Birth

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Abstract

Objective: To determine the diagnostic accuracy of measurement of cervical length using transvaginal ultrasound in women at risk of preterm delivery.

Methodology: This study was conducted in the department of Radiology and Obstetrics and Gynecology from June 2021 to December 2021. Total 133 women were recruited in this study as per inclusion and exclusion criteria. Each patient underwent a general examination, abdominal examination, routine investigations, and ultrasound scan for gestational age assessment and to rule out any possible abnormalities. After cervical length measurements were done at presentation to the labor ward, after four hours. These measurements were made via the TVUS method and were performed by designated sonographers who had extensive experience. The participants were treated and followed up until delivery according to the hospital's protocol. A statistical package for social sciences was used for data entry and analysis. The odds ratio and diagnostic accuracy was calculated for cervical length to predict preterm birth.

Results: In preterm group, a significantly higher number of women had cervical length <3 as compared to women who had term birth. i.e. 85.5% vs. 26.8%, p-value<0.001 & Odds ratio=16.11 (95% CI: 6.68-38.87). The odds ratio showed that women with cervical length <3 had 16.11 times higher chances of preterm birth. Sensitivity, Specificity, Positive predictive, Negative predictive and diagnostic accuracy of cervical length <3 was 85.48%, 73.24%, 73.16%, 85.25% and 78.95% respectively.

Conclusion: Based on the results of this study, it can be concluded that the assessment of cervical length with transvaginal ultrasonography can be used as a diagnostic tool for female presetting with threatened preterm labor.

Key Words: Cervical length, Preterm birth, Term birth, Diagnostic accuracy, Threatened preterm labor

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Introduction

It is estimated that 5%–18% of all live births are preterm, which is defined as a delivery occurring before 37 weeks of gestation. In most countries, it is the leading cause of newborn morbidity and death.[1,2] Premature babies have greater death and morbidity rate than full-term babies. Preterm birth-related complications claim the lives of 1.1 million children each year.[3] Studies have shown that previous preterm deliveries and a short cervical length (CL) are the highest risk factors for this illness, although many preterm births occur without any risk factors.[4-6]

Cervical length and the foetal fibronectin level have been used to test for spontaneous preterm birth in the womb.[7] Predicting which pregnancies are at elevated risk of spontaneous preterm delivery is critical to the success of these interventions (SPTB).[7] The gold standard for measuring cervical length is transvaginal ultrasonography, which can be done in most obstetric practices. Preterm labour screening and prevention

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techniques might be less effective without transvaginal ultrasonography in certain resource-constrained areas.[8]

Numerous studies have shown that determining the cervical length (CL) using transvaginal ultrasonography (TVU) during the second half of pregnancy is an accurate predictor of future preterm birth (PTB) in both singletons and twins[9, 10] and a decade of research has shown that giving progestogens to high-risk women carrying a singleton reduces the incidence of spontaneous preterm birth by half.[11, 12]

Using transvaginal ultrasound between 16 and 24 weeks of gestation, a short cervical length (CL) evaluation is a relatively reliable predictor of SPTB.[7] SPTB risk is inversely related to CL; regardless of reproductive history, individuals with the shortest CL have the greatest risk of SPTB.[7] To define a "short" CL, current research ranges from 15 to 30 mm depending on the population examined and the gestational age at evaluation.[7, 13, 14]

According to individual patient-level data, CL knowledge was associated with a significant decrease in the risk of PTB at 37 weeks of gestation (RR 0.64, 95 percent CI: 0.44-0.94). There was no significant difference between individuals who had awareness of CL and those who did not when it came to other outcomes, such as PTB 36 weeks of gestation, time from randomization to delivery, assessment to discharge, and other neonatal outcomes.[7, 14, 15]

Greco E has demonstrated that cervical length at 11–13 weeks' gestation, with maternal history, may identify nearly half of the pregnancies that end in preterm birth before 34 weeks, with a false-positive rate of 10%. However, the difference in cervical length between the normal group and the preterm-birth group was just 5 mm, which raises issues about whether this approach can be used for general screening.[4]

Cervical length measurement during the first trimester has been used in previous research to predict PTB, however the findings are inconsistent. First-trimester screening for PTB was 54.8% accurate in 2012, with a false-positive rate of 10%, according to Greco et al., a study published in 2012.[4]

The likelihood of a short cervix in the second trimester is linked to the length of the first-trimester cervical length, according to Wulff et al. A 50% accuracy rate for predicting short second-trimester cervical length based on first-trimester cervical length was achieved.[16] It's also true that some research have indicated that cervical length isn't a good indicator of preterm birth in the first trimester.[17, 18]

Methodology

This cross sectional study was conducted in the department of Radiology and Obstetrics and Gynecology June 2021 to December 2021. Total 133 women were included in the study with threatened preterm labor who were admitted. The sample size of 133 women with threatened preterm labor was calculated using the following parameters. i.e., prevalence of preterm as 21.64%[19], sensitivity, and specificity of cervical length as 77.8%[20] and 61.6%[20] with 10% desired precision and 80% confidence level. Institutional review board and ethical approval were obtained from the institutional ethical review board committee.

Women aged 20-45 years of age with singleton gestation are diagnosed with threatened preterm labor (defined as a condition which is in regular uterine contractions occur at least 1 time in 10 minutes and persist for more than 30 minutes before the completion of 37 weeks of gestation without dilatation of the cervix)[21] were included in the study. Previa placenta, bleeding diseases (endocervical polyp), infection, and bleeding tumors and if the image after TVS was deemed unsatisfactory due to incorrect anatomy, the anteriorly lower uterine segment, or the cervical canal was unduly constricted by any masses were excluded from the study.

Because they had medically indicated preterm birth, which included severe intrauterine growth restriction and extended preterm premature membrane rupture, as well as a preeclamptic condition with severe characteristics and non-reassuring foetal state. All of the patients were extensively inspected. Each patient had a general checkup, abdominal examination (inspection, palpation, auscultation of foetal heart sounds, and vaginal examination), regular tests, and an ultrasound scan to determine gestational age and rule out any probable abnormalities. As soon as the patient was admitted into labour, a doctor measured the length of the cervix. Using the TVUS approach, these measurements were carried out by specially trained sonographers. The shortest cervical length measurement was taken during each inspection, which lasted three minutes. The participants were cared for and monitored by the hospital's protocols throughout their pregnancy. Medical records were reviewed to

gather information on pregnancy and neonatal outcomes.

Data was entered and analyzed with SPSS version 25. Quantitative variables were presented with mean±SD and qualitative variables were presented with frequency and percentage. Independent sample t-test was used to compare mean cervical length among women with preterm and term birth. Chi Square test was applied to compare cervical length (<3 & >3) between delivery outcome. A 2x2 table was constructed to calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of cervical length and compare it with delivery outcome. Statistical significance was defined as a p-value of < 0.05.

Results

The mean age of women in this study was 30.16±5.93 years. In 44(33.1%) women BMI was normal and 47(35.3%) were obese. Among these women, 104(78.2%) had a C-section and 62(46.6%) had preterm birth. The mean cervical length of women was 30.24±1.44 mm. (Table I)

Table I: Characteristics of study Population (n=133)

Age	30.16±5.93 Years [20-40 years]	
	Frequency	**Percent**
Body Mass Index		
Normal	44	33.1%
Overweight	42	31.6%
Obese	47	35.3%
Abortion History	35	26.3%
PTB History	33	24.8%
GDM	20	15%
Hypertension	25	18.8%
Cervical Length	30.24±1.44 mm [27.50-33.80]	
Outcome		
Preterm Birth	62	46.6%
Term birth	71	53.4%

Table II: Diagnostic accuracy of Cervical length as predictor of preterm birth

	Outcome		**Total**	**Odds Ratio**
	Preterm Birth	**Term Birth**		
CL: <3 mm	53 (85.5%)	19 (26.8%)	72	16.11 (CI-95%:6.68-38.87)
CL:>3 mm	9 (14.5%)	52 (73.2%)	61	
Total	62	71	133	
p-value			<0.001	
Sensitivity: 85.48%, Specificity: 73.24%, PPV: 73.61%, NPV: 85.25% , Diagnostic Accuracy: 78.95%				

Mean cervical length was significantly (p-value<0.001) different among women with preterm and term birth. In preterm group significantly higher number of women (85.5% vs. 26.8%, p-value<0.001) had cervical length <3 as compared to women who had term birth with Odds ratio=16.11 (95% CI: 6.68-38.87). Odds ration showed that women with cervical length <3 had 16.11 times higher chances of preterm birth. Sensitivity, Specificity, Positive predictive, Negative predictive and diagnostic accuracy of cervical length <3 was 85.48%, 73.24%, 73.16%, 85.25% and 78.95% respectively. (Table II)

Discussion

In reviewing the literature about the evaluation of cervical length for predicting preterm birth. TVS-CL is a commonly used cervical marker in preterm birth prediction in both second and third trimesters.[8,9,14,24,25] In this study, the sensitivity and specify of cervical length <3 mm for prediction of preterm birth was 85.48% and 73.24% respectively. Different studies have reported variables diagnostic accuracy values and cut off values for cervical length for prediction of preterm birth. Women who had preterm birth among them mean cervical length was 29.46±0.77 and women with term birth had mean cervical length 30.93±1.55. A significant difference was seen for cervical length for preterm and term birth among women. Risk of preterm birth among women with cervical length <3mm was 16.11 times higher as compared to women with cervical length >3mm. i.e. (OR: 16.11, 95%CI: 6.68-38.897, p-value<0.001).

Fatemeh Foroozanfard used a cervical length cut point as 30mm. As per his findings, at this cut point, sensitivity, specificity, PPV and NPV for prediction of preterm was 31%, 96.8%, 71.1% and 85% respectively.[22] These results differ from the results of this study as of low sensitivity value. However, the specificity value was in line with the results of this study. Amr Mabrouk from Egypt reported significantly shorter cervical length among women with preterm birth as that of women with term birth. This finding is in line with the results of this study. He used a cut off value of ≤26 mm for prediction of preterm birth. With this cut off value sensitivity and specificity of cervical length was 100% and 45.9% respectively.[23] Contrary to shorter cervical length for mother with preterm birth Sedighe Borna from Iran reported no significant difference for cervical length among preterm and term birth. i.e. (Preterm: 33.18±3.61 vs. Term: 33.67±4.25, p-value=0.66)[24] Sireethorn Luechathananon in his study showed significant difference for median cervical length

between term and preterm birth and reported 72.1% sensitivity, 46.2% specificity, 33% PPV and 81.8% NPV for cervical length <3.4 cm.[25]

To accurately forecast preterm delivery, one of the most critical problems is when to measure cervical length. Asymptomatic women with a history of PTB should have their cervical length checked between 16 and 24 weeks of pregnancy, according to the majority of professional recommendations that address this topic.[26] It should not be routinely measured before 16 weeks of gestation[27] as the predictive accuracy of first and early second-trimester CL assessment for PTB is low, especially in asymptomatic women without a history of PTB.[4,28] Because mostly studies on interventions to prevent preterm birth (e.g, cervical cerclage, vaginal progesterone) have used 24 weeks of gestation as the maximum limit for screening and initiation of therapies or interventions, routine CL screening is not recommended after 24 weeks of gestation in asymptomatic women.[14, 29]

Regular cervical length evaluation in women at low risk is not suggested at this time by the Society of Obstetricians and Gynecologists of Canada or the Society for Maternal-Fetal Medicine due to low prevalence and weak positive predictive values.[26, 30] Women who are at elevated risk of preterm birth may be accurately predicted using ultrasound cervical measurements. The transvaginal approach seems to be the most extensively researched and is widely accepted by female patients. In addition, if the results are positive, it may be used to avoid needless procedures in women at high risk of premature birth.[30]

Because numerous pathways may be dependent on many initiators and risk factors, studying just one consequence may be difficult. There are a wide range of risk variables for spontaneous preterm births that have not been explored in isolation in the present study sample. It might explain why CL is a reliable but somewhat inaccurate predictor of spontaneous preterm deliveries in high-risk women, especially in the context of pregnancy complications. While it's possible that this represents the test's real-world applicability, it's risky to presume that a single variable will serve as a universal predictor when many causes are at play.[31] This study has some limitations. This study did not categorize preterm birth into early and late preterm birth.

Conclusion

Based on results of this study it can be concluded that assessment of cervical length with transvaginal ultrasonography can be used as a diagnostic tool for female presetting with threatened preterm labor.

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