



MID-TRIMESTER CERVICAL LENGTH ASSESSMENT USING TRANSVAGINAL SONOGRAPHY: A PREDICTOR FOR PRETERM LABOR IN ASYMPTOMATIC SINGLETON PREGNANCIES

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Abstract

Background and Aim: Preterm delivery presents a considerable challenge in obstetrics globally, leading to a range of complications for newborns during their neonatal period and potentially impacting their health throughout their lives. The length of the cervix is recognised as a key indicator of the risk for preterm labour. Transvaginal sonography (TVS) offers a more precise and timely detection of cervical length shortening compared to traditional digital assessment methods. This study focused on assessing the length of the cervical canal through transvaginal sonography in singleton pregnancies occurring between 18 and 26 weeks of gestation.

Material and Methods: This research aimed to assess the efficacy of cervical length as a predictor for pre-term labour. Cervical length assessment is conducted using transvaginal ultrasound techniques. Patients with a length of less than 25 mm were recommended to undergo a second scan at the 28th week, with follow-up continuing until delivery.

Results: The findings indicate that the majority of patients were within the 25-30 year age range. The distinction is considered statistically significant when the p-value is less than 0.05. Research indicates that patients exhibiting reduced cervical length in the mid-trimester face an increased likelihood of experiencing pre-term delivery. The area under the fitted curve is 0.8, with an estimated standard error of 0.06. The sensitivity is reported at 61%, while the specificity stands at 8.85%. The positive predictive value is 57.50%, and the negative predictive value is 89.90%.

Conclusion: Research indicates that cervical length serves as a predictor for the risk of preterm delivery in women who do not exhibit any symptoms. Transvaginal ultrasound has proven to be an effective, safe, and straightforward noninvasive outpatient procedure for measuring cervical length.

Key Words: Cervical Length, Preterm Delivery, Singleton Pregnancy, Transvaginal Ultrasound

Introduction

Preterm birth refers to the occurrence of childbirth that takes place between the point of viability and 37 completed weeks of gestation. The prevalence of preterm birth in India varies from 5% to 21%. Preterm delivery occurs when uterine contractions are strong and frequent enough to lead to progressive cervical dilation and effacement before the completion of 37 weeks, or 259 days, of gestation, during a period when the foetus is viable. Premature birth stands as the primary cause of mortality among newborns and ranks as the second most prevalent cause of death in children under the age of five. The impact extends beyond mortality, significantly elevating neonatal morbidity. Premature infants face a heightened risk for conditions such as cerebral palsy, learning disabilities, respiratory distress, neonatal sepsis, intraventricular haemorrhage, hypoglycemia, necrotising enterocolitis, retinopathy of prematurity, hyperbilirubinemia, and pneumonia.^{1,2} Premature infants experience higher rates of morbidity when compared to full-term infants, largely due to the immaturity of their organ systems.

Preterm labour is initiated by various processes, many of which mirror those that trigger term delivery. Other contributing factors encompass cervicovaginal infections, asymptomatic bacteriuria, cervical incompetence, decidual haemorrhage, and uterine overdistension. Transvaginal sonographic measurement of cervical length stands out as the most precise approach for forecasting spontaneous preterm birth. While there has been a significant rise in premature deliveries attributed to induction and caesarean sections for both maternal and foetal reasons, it is important to note that approximately 70-80% of preterm births happen spontaneously.^{3, 4, 5}

The study aimed to achieve several key objectives: first, to measure the length of the cervical canal using transvaginal sonography in singleton pregnancies between 18 and 26 weeks of gestation; second, to explore the relationship between cervical length during the midtrimester and the due date; and third, to assess the potential of routine cervical length measurements during this gestational period in predicting the risk of preterm delivery.

Material and Methods

An observational study was carried out in the Department of Gynaecology at a tertiary care teaching institute in India over the course of one year, involving 150 patients.

In this study, we focused on asymptomatic antenatal women who are between 18 to 26 weeks of gestation. Participants were required to have registered before reaching 16 weeks of gestation and must have a known last menstrual period (LMP). Additionally, we included antenatal women within the same gestational age who presented with specific high-risk factors. These factors included a history of threatened abortion during the current pregnancy, previous first or second trimester abortions, a past occurrence of preterm birth, or being a second gravida with an inter-pregnancy interval of less than 1.5 years or more than 5 years.

The study excluded the following criteria: 1. The occurrence of multiple pregnancies 2. Congenital foetal anomaly 3. Excessive Amniotic Fluid 4. Iatrogenic preterm birth resulting from severe preeclampsia, intrauterine foetal growth restriction, and other related factors.

The measurement of cervical length is conducted through transvaginal ultrasound, following the acquisition of informed, written consent. Patients are then advised to schedule a follow-up appointment in 3-4 weeks. Patients with a cervical length exceeding 25 mm do not undergo further follow-up scans, and details regarding their gestational age at delivery and delivery method are recorded. When the measurement is less than 25 mm, a follow-up scan is conducted until 28 weeks, with patients being closely monitored throughout the entire pregnancy until delivery.

Statistical analysis

The collected data was organised and input into a spreadsheet application (Microsoft Excel 2019) before being transferred to the data editor interface of SPSS version 19 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were characterised using means and standard deviations or medians and

interquartile ranges, depending on their distribution patterns. Qualitative variables were reported in terms of counts and percentages. The confidence level for all tests was established at 95%, while the level of significance was determined to be 5%.

Results

Among the 150 patients studied, 30 were multigravida, while 120 were primigravida. A total of 34 individuals experienced pre-term delivery, while 116 individuals had term delivery. The average age of the population was 26.1 years, with a standard deviation of 4.2 years. The majority of patients were in the 25-30 year age bracket. The distinction is considered statistically significant when the p-value is less than 0.05. Research indicates that patients exhibiting reduced cervical length during the mid-trimester face an increased likelihood of experiencing pre-term delivery.

The area under the fitted curve is 0.8, with an estimated standard error of 0.06. The sensitivity is reported at 61%, while the specificity stands at 8.85%. Additionally, the positive predictive value is 57.50%, and the negative predictive value is 89.90%.

Table 1: Cervical length

| Cervical length (mm) | N | Pre-Term Delivery | Percentage (%) |
|----------------------|----|-------------------|----------------|
| <25 | 30 | 17 | 56.6 |
| 26-30 | 27 | 10 | 37.03 |
| 31-35 | 33 | 5 | 15.15 |
| 36-40 | 51 | 1 | 1.96 |
| >40 | 9 | 1 | 11.11 |

Discussion

Pre-term labour refers to the onset of uterine contractions that are sufficiently frequent and intense to lead to the gradual effacement and dilation of the cervix, occurring between 20 and 37 weeks of gestation. Research indicates that there are four primary factors contributing to preterm birth: (1) spontaneous preterm labour with intact membranes, (2) preterm premature membrane rupture, (3) iatrogenic causes, and (4) multiple pregnancies.^{4,6} A study conducted by Visintine et al found that women with a history of recurrent induced abortions experienced a three-fold increase in the likelihood of preterm delivery compared to those with singleton pregnancies.⁵ A study conducted by Iams et al in 1996 involving 2,915 pregnant women revealed an inverse relationship between cervical length, as measured by ultrasonography, and the incidence of preterm delivery. A transvaginal ultrasound conducted at 24 weeks of gestation revealed a positive predictive value of 18% and a negative predictive value of 97%. While the predictive value remains low, it has been observed to increase in cases of prematurity.⁷ Individuals at risk for preterm labour undergo careful monitoring through various methods, including home ambulatory uterine activity assessments, foetal fibronectin tests, salivary oestriol levels, corticotropin-releasing hormone evaluations, relaxin measurements, and the analysis of inflammatory cytokines such as IL-6 and IL-8, TNF beta, and phosphorylated insulin-like growth factor binding protein.^{2,8-10}

Women facing the risk of premature labour could find value in sonography as a means to assess cervical length. Their negative predictive value is the primary factor contributing to their overall value. In the last decade, there have been significant advancements in the techniques used for measuring cervical length. ACOG recommends transvaginal sonography as the optimal approach for identifying women at increased risk of spontaneous preterm birth, emphasising the importance of making this option accessible to those affected. In our study, participants exhibiting cervical lengths below 26 mm experienced a higher incidence of pre-term labour compared to those with cervical lengths exceeding 25 mm during the mid-third trimester.^{11,12} A cervical length of less than 25 mm is a significant predictor of preterm birth, with ultrasonography being the most effective method for measurement. Transvaginal ultrasonography demonstrates superior sensitivity and negative predictive value compared to other ultrasonographic techniques. Sandra O'Hara and colleagues conducted a study examining cervical length as a predictor of preterm birth, alongside a comparison of various

ultrasonic measurement techniques. The necessity of cervical length screening in low-risk pregnancies remains a topic of debate among healthcare professionals.¹³ A study conducted by Owen et al involving 183 women highlighted that cervical length serves as a significant indicator of cervical incompetency. This finding suggests that further investigation into the relationship between cervical length and spontaneous preterm delivery is warranted. The study indicates a higher positive predictive value, likely attributed to the inclusion of a larger cohort of pregnant women with a prior history of spontaneous preterm delivery. A study involving 48 women who experienced spontaneous preterm birth before 35 weeks found that measuring cervical length can effectively predict preterm birth in those at high risk.¹⁴ In 2016, a study by Preeti et al. examined 100 high-risk asymptomatic women, measuring cervical length through transvaginal ultrasound. The findings revealed a positive predictive value of 6% and a negative predictive value of 100% for women with a cervical length of less than 25mm at under 28 weeks of gestation. At 32 weeks, the figures stood at 16% and 100%. By 34 weeks, they increased to 30% and 98%, while at 37 weeks, the rates were 50% and 86%, respectively.¹⁵ The measurement of cervical length as a predictor of preterm birth is widely recognised among high-risk women; however, its routine application in antenatal care via transvaginal ultrasound remains a topic of ongoing discussion. Cervical length shortening is a significant indicator in women at risk of imminent preterm delivery. Research indicates that the earlier this shortening occurs, the higher the likelihood of preterm birth.

The study faced limitations due to a smaller sample size, and there remains the possibility that unforeseen confounding factors could have influenced the outcomes.

Conclusion

Research indicates that cervical length serves as a predictor for the risk of preterm delivery among asymptomatic women. Transvaginal ultrasound is recognised as an effective, safe, and straightforward noninvasive outpatient procedure for measuring cervical length. Given the association of preterm delivery with perinatal morbidity and mortality, it is essential to identify effective screening techniques that aid in prediction and facilitate effective management strategies. Reducing preterm deliveries has the potential to alleviate significant economic, medical, and social burdens both nationally and globally.

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