

ROLE OF MID-TRIMESTER CERVICAL LENGTH SCREENING IN PREDICTING AND PREVENTING PRETERM BIRTH: A PROSPECTIVE OBSERVATIONAL STUDY IN A TERTIARY CARE HOSPITAL IN NORTH INDIA

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ABSTRACT

Background: Preterm birth is a leading cause of neonatal morbidity and mortality worldwide, with a disproportionately high burden in developing countries like India. Early identification of women at risk remains a challenge. Cervical length measurement using transvaginal ultrasonography has emerged as a reliable predictor of preterm birth.

Objectives: To evaluate the role of mid-trimester cervical length screening in predicting and preventing preterm birth in a tertiary care hospital setting.

Methods: This prospective observational study was conducted among 64 pregnant women between 18 and 24 weeks of gestation at a tertiary care hospital in North India from June 2020 to October 2020. Cervical length was measured using transvaginal ultrasonography. A cervical length of <25 mm was considered short. Participants were followed until delivery, and the occurrence of preterm birth (<37 weeks) was recorded. Statistical analysis was performed using SPSS version 22.0, with $p < 0.05$ considered significant.

Results: The prevalence of short cervix was 17.2%, and the overall incidence of preterm birth was 20.3%. A significantly higher proportion of women with cervical length <25 mm experienced preterm birth compared to those with normal cervical length (63.6% vs 11.3%, $p = 0.001$). The mean cervical length was significantly lower in the preterm group (24.1 $\pm$ 3.2 mm) compared to the term group (32.8 $\pm$ 4.5 mm; $p < 0.001$).

Conclusion: Mid-trimester cervical length screening is an effective tool for identifying women at increased risk of preterm birth. Its integration into routine antenatal care can enable early intervention and improved pregnancy outcomes. Further large-scale studies are warranted to strengthen evidence and guide policy implementation.

Keywords: Preterm birth; Cervical length; Transvaginal ultrasonography; Pregnancy outcome; Screening; North India

INTRODUCTION

Preterm birth, defined as delivery before 37 completed weeks of gestation, remains a major global public health concern and is a leading cause of neonatal morbidity and mortality worldwide [1]. According to global estimates, approximately 15 million babies are born preterm each year, accounting for nearly one in ten births, with a disproportionate burden in low- and middle-income countries [2]. Complications of prematurity contribute significantly to neonatal deaths and long-term adverse outcomes, including neurodevelopmental impairment, chronic respiratory disease, and increased healthcare utilization [3]. Despite advances in obstetric and neonatal care, the incidence of preterm birth has shown only modest decline, emphasizing the need for effective preventive strategies [4].

In the context of South Asia, particularly India, the burden of preterm birth is substantial, with the country contributing one of the highest numbers of preterm deliveries globally [5]. Factors such as maternal malnutrition, infections, inadequate antenatal care, and socioeconomic disparities further exacerbate the risk [6]. In addition to these, a significant proportion of preterm births occur in women without identifiable risk factors, limiting the effectiveness of traditional risk-based screening approaches [7]. Therefore, there is a growing emphasis on identifying reliable and objective predictors that can facilitate early detection and timely intervention.

One such promising tool is transvaginal ultrasonographic measurement of cervical length during the mid-trimester. Cervical shortening has been strongly associated with an increased risk of spontaneous preterm birth, as it reflects early cervical remodeling and insufficiency [8]. Numerous studies have demonstrated that a shorter cervical length, particularly less than 25 mm between 18 and 24 weeks of gestation, is a significant predictor of preterm delivery [9]. Importantly, cervical length screening is non-invasive, reproducible, and can be incorporated into routine antenatal ultrasound assessments.

Furthermore, identification of women with a short cervix allows for targeted interventions such as progesterone therapy, cervical cerclage, or pessary placement, which have been shown to reduce the risk of preterm birth in selected populations [10]. However, the implementation of universal cervical length screening remains debated, especially in resource-limited settings, due to concerns regarding cost-effectiveness, accessibility, and variability in clinical outcomes.

In India, particularly in tertiary care hospital settings, there is limited data evaluating the practical utility and effectiveness of cervical length screening as a preventive strategy for preterm birth. Most available studies are either from high-income countries or are limited by small sample sizes and heterogeneous populations, making it difficult to generalize findings to the local context [6]. Additionally, there is a need to assess how cervical length measurement correlates with pregnancy outcomes in routine clinical practice in North Indian populations.

Given this background, the present study was undertaken to evaluate the role of cervical length screening in predicting and potentially preventing preterm birth in a tertiary care hospital in North India. The aim of the study was to assess the association between mid-trimester cervical length and the incidence of preterm delivery, and to determine its utility as a screening tool in identifying high-risk pregnancies for timely intervention.

METHODOLOGY

Study Design: This was a prospective observational cohort study conducted to evaluate the role of mid-trimester cervical length screening in predicting and preventing preterm birth, in accordance with the STROBE guidelines for observational studies.

Study Setting: The study was carried out in the Department of Obstetrics and Gynecology at a tertiary care teaching hospital in North India, which caters to both urban and rural populations and provides comprehensive antenatal and intrapartum care.

Study Duration: June 2020 till October 2020.

Study Population: Pregnant women attending the antenatal outpatient department (OPD) and fulfilling the eligibility criteria during the study period were enrolled. All participants were followed prospectively until delivery.

Inclusion Criteria

- Singleton pregnancy
- Gestational age between 18 and 24 weeks confirmed by last menstrual period or first-trimester ultrasound
- Willingness to participate and provide informed consent

Exclusion Criteria

- Multiple gestation
- Known uterine anomalies
- History of cervical cerclage in the current pregnancy prior to recruitment
- Presence of active vaginal bleeding or ruptured membranes at the time of examination
- Known major fetal congenital anomalies
- Medically indicated preterm delivery (e.g., severe preeclampsia, placenta previa)

Sample Size: The sample size was calculated based on the expected prevalence of short cervical length (<25 mm) among pregnant women, assumed to be approximately 15% based on previous literature. Using the formula for estimating a proportion in a finite population:

$$n = Z^2 \times p \times (1-p) / d^2$$

Where:

$Z = 1.96$ (for 95% confidence level)

$p = 0.15$

$d = 0.10$ (absolute precision)

The calculated sample size was approximately 49. To account for possible loss to follow-up and incomplete data, the sample size was increased by 20%, resulting in a final sample size of 64 participants.

Sampling Technique: A consecutive sampling method was employed, wherein all eligible pregnant women attending the antenatal clinic during the study period were recruited until the desired sample size of 64 was achieved.

Data Collection Tools & Procedure: After obtaining informed written consent, eligible participants underwent a detailed clinical evaluation including demographic data, obstetric history, and relevant risk factors using a predesigned and pretested proforma. Transvaginal ultrasonography was performed between 18 and 24 weeks of gestation to measure cervical length using a standardized technique. The shortest of three measurements was recorded in millimeters. Participants with a cervical length less than 25 mm were identified as having a short cervix. These women received appropriate management as per institutional protocol, which could include progesterone supplementation and increased surveillance. All participants were followed up regularly through antenatal visits and their pregnancy outcomes, including gestational age at delivery, were recorded.

Study Variables: The primary independent variable was cervical length measured in millimeters during the mid-trimester (18–24 weeks). It was further categorized as <25 mm (short cervix) and ≥25 mm (normal cervix). The primary dependent variable was the occurrence of preterm birth, defined as delivery before 37 completed weeks of gestation. Secondary variables included maternal age, parity, socioeconomic status, and obstetric history, which were considered potential confounders.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 22.0. Descriptive statistics were used to summarize baseline characteristics. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The association between cervical length and preterm birth was assessed using the Chi-square test or Fisher's exact test as appropriate. Student's t-test was used for comparison of means. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient information was strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki. Participation was voluntary, and participants were free to withdraw from the study at any point without affecting their standard medical care.

RESULTS

A total of 64 pregnant women were included in the study. The majority of participants were aged between 25–30 years, and slightly more than half were multigravida (Table 1)

Table 1: Baseline Characteristics of Study Participants (n = 64)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	<25	26	40.6
	25–30	28	43.8
	>30	10	15.6
Parity	Primigravida	30	46.9
	Multigravida	34	53.1
Socioeconomic Status	Low	22	34.4
	Middle	34	53.1
	High	8	12.5
Previous Preterm Birth	Yes	9	14.1
	No	55	85.9

Short cervical length (<25 mm) was identified in 17.2% of participants, while the majority had a normal cervical length (Table 2)

Table 2: Distribution of Cervical Length Among Participants

Cervical Length Category	Frequency (n)	Percentage (%)
<25 mm (Short cervix)	11	17.2
≥25 mm (Normal)	53	82.8

The overall incidence of preterm birth in the study population was 20.3% (Table 3)

Table 3: Incidence of Preterm Birth in Study Population

Outcome	Frequency (n)	Percentage (%)
Preterm Birth (<37 weeks)	13	20.3
Term Birth (≥37 weeks)	51	79.7

A statistically significant association was observed between short cervical length and the occurrence of preterm birth ($p = 0.001$). Women with cervical length <25 mm had a markedly higher proportion of preterm births compared to those with normal cervical length (Table 4)

Table 4: Association Between Cervical Length and Preterm Birth

Cervical Length	Preterm Birth (n, %)	Term Birth (n, %)	Total	p-value
<25 mm	7 (63.6%)	4 (36.4%)	11	0.001*
≥25 mm	6 (11.3%)	47 (88.7%)	53	
Total	13	51	64	

*Statistically significant ($p < 0.05$)

Additionally, the mean cervical length was significantly lower among women who delivered preterm compared to those who delivered at term, indicating a strong inverse relationship between cervical length and risk of preterm delivery (Table 5)

Table 5: Mean Cervical Length in Relation to Pregnancy Outcome

Outcome	Mean Cervical Length (mm) ± SD
Preterm Birth	24.1 ± 3.2
Term Birth	32.8 ± 4.5
p-value	<0.001*

*Statistically significant

DISCUSSION

The present prospective observational study evaluated the role of mid-trimester cervical length screening in predicting preterm birth among pregnant women in a tertiary care setting in North India. The key findings indicate that a short cervical length (<25 mm) is significantly associated with an increased risk of preterm birth. Additionally, women who delivered preterm had a significantly lower mean cervical length compared to those who delivered at term, reinforcing the predictive value of cervical length measurement.

The observed prevalence of short cervix (17.2%) in this study is comparable to previously reported estimates ranging from 10% to 20% in similar populations [8,9]. This consistency supports the reliability of transvaginal ultrasonography as a standardized tool for cervical assessment. Furthermore, the overall incidence of preterm birth (20.3%) aligns with data from developing countries, including India, where higher rates have been attributed to socioeconomic and healthcare disparities [5,6].

A significant association between short cervical length and preterm birth was demonstrated in this study ($p = 0.001$), which is in agreement with earlier landmark studies. Jay D. Iams et al. first

established that a shorter cervical length measured during the mid-trimester is a strong predictor of spontaneous preterm delivery [8]. Similarly, other studies reported that women with a cervical length less than 25 mm are at significantly higher risk and may benefit from targeted interventions such as cerclage [9]. The findings of the present study corroborate these observations, demonstrating a markedly higher proportion of preterm births (63.6%) among women with short cervix.

The mean cervical length among women with preterm birth (24.1 ± 3.2 mm) was significantly lower than that in term deliveries (32.8 ± 4.5 mm), which further supports the inverse relationship between cervical length and gestational duration. This is consistent with studies that demonstrated that shorter cervical length is associated with increased risk of early delivery and that interventions such as vaginal progesterone can effectively reduce this risk [10]. Although the present study was not designed to evaluate the effectiveness of specific interventions, the identification of high-risk women through screening provides an opportunity for timely preventive measures.

From a clinical perspective, the incorporation of routine cervical length screening in mid-trimester ultrasound examinations could significantly enhance risk stratification, particularly in settings where traditional risk factors fail to identify a substantial proportion of women at risk [7]. In resource-limited settings like India, this approach may facilitate selective rather than universal intervention, thereby optimizing resource utilization while improving maternal and neonatal outcomes.[11-13]

However, some differences from existing literature should be noted. While larger multicentric studies have reported slightly lower rates of preterm birth among women with short cervix due to standardized intervention protocols, the relatively higher rate observed in this study may be attributed to the smaller sample size, variability in compliance, and differences in follow-up care. Additionally, the short duration of the study may have limited the ability to capture seasonal or temporal variations in outcomes.

The strengths of this study include its prospective design, standardized measurement of cervical length using transvaginal ultrasonography, and complete follow-up of participants until delivery. The use of clearly defined inclusion and exclusion criteria enhances the internal validity of the findings.

Nevertheless, certain limitations must be acknowledged. The sample size was relatively small ($n = 64$), which may limit the generalizability of the results. Being a single-center study, the findings may not be representative of the broader population. Furthermore, potential confounding factors such as infections, nutritional status, and compliance with interventions were not extensively analyzed. The study also did not evaluate the cost-effectiveness of routine screening, which is an important consideration in low-resource settings.

In conclusion, the findings of this study support existing evidence that mid-trimester cervical length measurement is a valuable predictor of preterm birth. Its integration into routine antenatal care, particularly in tertiary care settings, may aid in early identification of high-risk pregnancies and facilitate timely preventive strategies.

CONCLUSION

This study demonstrates that mid-trimester cervical length measurement is a significant predictor of preterm birth. Women with a cervical length of less than 25 mm had a markedly higher risk of delivering preterm compared to those with normal cervical length. The findings reinforce the inverse relationship between cervical length and gestational age at delivery, highlighting its clinical relevance as a screening tool. Incorporating routine cervical length assessment into antenatal care can facilitate early identification of high-risk pregnancies, allowing timely interventions such as progesterone

therapy and closer surveillance. This is particularly valuable in settings where conventional risk-based screening may fail to identify a substantial proportion of at-risk women.

Although limited by a small sample size and single-center design, the study provides important insights into the applicability of cervical length screening in a North Indian tertiary care setting. Larger multicentric studies are recommended to validate these findings and to assess cost-effectiveness. Overall, cervical length screening represents a practical and effective strategy for improving perinatal outcomes and reducing the burden of preterm birth.

DECLARATIONS

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Conflict of Interest:The authors declare no conflict of interest.

Consent:Written informed consent was obtained from all participants prior to inclusion in the study.

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