

EVALUATING THE ROLE OF CERVICAL LENGTH MEASUREMENT IN PREDICTING PRETERM BIRTH: A SYSTEMATIC ANALYSIS

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Abstract: *Evaluating cervical length measurement as a predictive tool for preterm birth is a critical focus in obstetrics and maternal-fetal medicine. The primary aim of this study is to find the role of cervical length measurement in predicting preterm birth. This prospective study was conducted in Lady Reading Hospital Peshawar from 2022 to 2023. Two hundred twenty pregnant females in their second trimester were recruited from the hospital's OPD. Baseline information is collected, including socio-demographic factors, clinical and medical history, and obstetric records. A transvaginal ultrasound assesses cervical length using standardised techniques. Baseline measurements serve as the initial data point for subsequent evaluations. Data were collected from 220 pregnant females. The mean age was 28.5 years (± 4.2), and the gestational age was 22 weeks (18-24). The average BMI stood at 25.1 kg/m² (± 3.5). Non-smokers constituted the majority, accounting for 81.8%, while smokers comprised 18.2% of the cohort. The mean cervical length at 22 weeks was 35.4 mm (± 4.6), ranging from 25 mm to 45 mm. The incidence of preterm birth stood at 14% (n=31), with 27% (n=17) of individuals having a cervical length ≤ 25 mm experiencing preterm birth, whereas 8% (n=14) with a cervical length > 25 mm faced the same. Progesterone was administered to 27.3% (n=60) of participants, while 72.7% (n=160) did not receive it. It is concluded that cervical length assessment at 22 weeks gestation presents a valuable predictor for preterm birth incidence within this cohort. The study highlighted a significant correlation between a cervical length of 25 mm or less and an increased risk of preterm delivery.*

Keywords: Cervical length measurement, Predictive tool, Preterm birth, Obstetrics, Maternal-fetal medicine, Second trimester

Introduction

Evaluating cervical length measurement as a predictive tool for preterm birth is a critical focus in obstetrics and maternal-fetal medicine. Preterm birth, a significant global health concern, poses risks to neonatal health and long-term developmental outcomes. Cervical length assessment has emerged as a potential predictor, offering valuable insights into the risk assessment and management of preterm labour (Romero et al., 2021). Preterm birth stands as a prominent cause of infant morbidity and mortality, occurring at a frequency ranging from 5% to 18%. The majority, about two-thirds, of premature births stem from spontaneous preterm birth, encompassing early onset of labour or preterm prelabour rupture of membranes (PPROM) (Singh et al., 2022). Despite notable advancements in neonatal care, which have notably enhanced survival rates and the quality of life for preterm infants in recent years, the anticipation and prevention of preterm birth remain pivotal to improving perinatal outcomes (Sawaddisan et al., 2020). Evaluating cervical length measurement as a predictive tool for preterm birth is a critical focus in obstetrics and maternal-fetal medicine. Preterm birth, defined as delivery before 37 weeks of gestation, remains a leading cause of neonatal morbidity and mortality worldwide (Luechathananon et al., 2021). Despite advancements in prenatal care, the ability to accurately identify and manage the risk of preterm birth

remains a challenge. Cervical length assessment has become a non-invasive and potentially effective method for predicting preterm labour (Nooshin et al., 2020).

Research indicates that transvaginal sonographic evaluation of cervical length during the second trimester serves as a robust predictor for spontaneous preterm birth. A cervix considered short, defined by a length of ≤ 25 mm between 22+0 to 24+6 weeks of gestation, demonstrates a sensitivity of 37.3%, specificity of 92.2%, positive predictive value (PPV) of 17.8%, and negative predictive value (NPV) of 97.0% for predicting spontaneous preterm birth at < 35 weeks of gestation (Wong et al., 2021). Clinical trials have highlighted the efficacy of vaginal progesterone administration in women with a short cervix, showcasing a reduction of approximately 40% in the risk of spontaneous preterm birth (Maia et al., 2020).

The cervix, positioned distally from the uterine body and bordered superiorly by the uterine isthmus, represents the anatomical and histological juncture where the muscular uterus meets the fibrous cervical stroma (Hughes et al., 2020). Progress in anticipating and averting preterm birth among asymptomatic women has been notable. Assessing the length of the uterine cervix yields a sensitivity of 55% with a 10% false positive rate. Additionally, administering progesterone to women with a short cervix (< 15 mm) can diminish the probability of preterm birth before 34 weeks

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gestation by 45% (Thain et al., 2020). The evaluation of the cervix serves as a predictive tool for preterm birth, founded on the concept that cervical changes reflect the underlying pathological process culminating in premature delivery. While cervical length (CL) was traditionally gauged through digital examination, transvaginal ultrasound studies have confirmed that digital assessment underestimates cervical length. Furthermore, numerous investigations advocate that ultrasound assessment surpasses clinical examination in accurately predicting preterm birth based on cervical length measurements (Reicher et al., 2021). Thus, the primary aim of this study was to find the role of cervical length measurement in predicting preterm birth.

Methodology

This prospective study was conducted in Lady Reading Hospital Peshawar from 2022 to 2023. Two hundred twenty pregnant females in their second trimester were recruited from the hospital's OPD. Inclusion criteria encompass individuals with singleton pregnancies and no prior history of cervical surgery. Participants are briefed about the study's objectives, and their consent is obtained.

Baseline information is collected, including socio-demographic factors, clinical and medical history, and obstetric records. A transvaginal ultrasound assesses cervical length using standardised techniques. Baseline measurements serve as the initial data point for subsequent evaluations. Scheduled follow-up appointments were established for regular monitoring throughout the pregnancy. Transvaginal ultrasound assessments were conducted at specific intervals to track cervical length changes and ensure consistency in measurement techniques. Data analysis was collected using SPSS v26. Correlation tests and regression models are employed to evaluate the relationship between cervical length measurements and the incidence of preterm birth. Subgroup analyses are conducted to identify any demographic or clinical variables influencing outcomes.

Results

Data were collected from 220 pregnant females. The mean age was 28.5 years (±4.2), and the gestational age was 22 weeks (18-24). The average BMI stood at 25.1 kg/m² (±3.5). Non-smokers constituted the majority, accounting for 81.8%, while smokers comprised 18.2% of the cohort. Most participants had no prior history of preterm birth (90.9%), whereas 9.1% had experienced it previously. In terms of education, Bachelor's degree holders were the largest group (45.5%), followed by individuals with a Master's/PhD (31.8%) and those with a high school education (22.7%). Regarding socioeconomic status, most fell within the middle bracket (54.5%), while lower and upper socioeconomic status constituted 31.8% and 13.6%, respectively (Table 1).

The mean cervical length at 22 weeks was 35.4 mm (±4.6), ranging from 25 mm to 45 mm. The incidence of preterm birth stood at 14% (n=31), with 27% (n=17) of individuals having a cervical length ≤25 mm experiencing preterm birth, whereas 8% (n=14) with a cervical length >25 mm faced the same. Progesterone was administered to 27.3% (n=60) of participants, while 72.7% (n=160) did not receive

it. A small proportion, 4.5% (n=10), had a history of cervical surgery, while the majority, 95.5% (n=210), did not (Table 2). 12 (20 %) patients were administered progesterone. Average cervical length measured 35.4 mm (±4.6), spanning from 25 mm to 45 mm. Additionally, within this timeframe, the observed incidence of preterm birth was 14%, with 31 cases recorded among the participants (Table 3).

Table 1: Demographic data of patients

Characteristic	Values
Age (Y)	Mean: 28.5 ± 4.2
Gestational age	22 weeks (range: 18-24)
BMI (Kg/m ²)	Mean: 25.1 ± 3.5
History of smoking	
Non-smokers	180 (81.8%)
Smokers	40 (18.2%)
Previous preterm birth history	
Absent	200 (90.9%)
Present	20 (9.1%)
Educational level	
High School	50 (22.7%)
Bachelor's Degree	100 (45.5%)
Master's/PhD	70 (31.8%)
Socioeconomic status	
Lower	70 (31.8%)
Middle	120 (54.5%)
Upper	30 (13.6%)

Table 2: Clinical values of patients

Clinical Parameters	Values (n=220)
Cervical Length at 22 Weeks	Mean: 35.4 ± 4.6 mm Range: 25 mm to 45 mm
Preterm Birth Incidence	14% (n=31)
Cervical Length and Preterm Birth	
≤25 mm	27% (n=17)
>25 mm	8% (n=14)
Progesterone Administration	Yes: 60 (27.3%) No: 160 (72.7%)
History of Cervical Surgery	Yes: 10 (4.5%) No: 210 (95.5%)
Prenatal Care Visits (mean)	9.2 ± 1.8

Table 3: Cervical length measurement and preterm birth incidence

Gestational Age	Mean Cervical Length (mm)	Preterm Birth Incidence (%)
22 weeks	35.4 ± 4.6	14% (n=31)
	Range: 25 mm to 45 mm	

Table 4: Association between cervical length and preterm birth

Cervical Length at 22 Weeks	Preterm Birth Incidence (%)
≤25 mm	27% (n=17)
>25 mm	8% (n=14)

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There is a difference in preterm birth incidence between individuals with cervical length measurements at or below 25 mm compared to those with measurements exceeding 25 mm at 22 weeks of gestation. The incidence of preterm birth appears higher in the group with a cervical length of 25 mm or less (table 4).

Discussion

The findings indicate a compelling association between cervical length measurements at 22 weeks of gestation and this cohort's incidence of preterm birth. Individuals with cervical lengths equal to or less than 25 mm exhibited a substantially higher preterm birth incidence of 27% compared to those with cervical lengths exceeding 25 mm, where the incidence notably dropped to 8% (Du et al., 2020). This discrepancy underscores the potential predictive value of cervical length assessment in identifying individuals at heightened risk for preterm birth. These results align with existing literature, reinforcing that a shorter cervical length during the second trimester may serve as a valuable marker for increased susceptibility to preterm delivery (Pizzella et al., 2020).

The predictive accuracy of a shorter cervical length (CL) in anticipating spontaneous preterm birth (PTB) is significantly linked to the selected cutoff point. Sensitivity reports for a CL \leq 25 mm as a predictor of PTB among both high and low-risk women span a wide range from 6% to 76%. A seminal study by Iams et al. notably addressed the correlation between CL and PTB risk (Bortoletto et al., 2021). Cervical insufficiency, defined as the cervix's inability to maintain a pregnancy without contractions or labour, plays a pivotal role. While CL proves reliable in forecasting preterm birth, the exposure of membranes to ascending infections emerges as a crucial factor. Remarkably, even a short, closed cervix measuring $<$ 10 mm might result in a term pregnancy (Radan et al., 2020). Transvaginal ultrasound (TVU)-assessed CL significantly outperforms past obstetric history in predicting PTB. As the cervix shortens, the likelihood of subsequent preterm delivery rises, yet its precision remains influenced by a woman's risk status (Benito Vielba et al., 2022; Leow et al., 2020; Patberg et al., 2021). The risk of PTB in a low-risk woman with a cervix $<$ 25 mm stands at half that of a high-risk woman with a similar cervical length. Studies by Romero et al. underscore that shorter CL corresponds to an escalated risk of spontaneous PTB. However, it's crucial to note that most women (75%) with shortened cervixes do not experience preterm delivery (Rawashdeh et al., 2020).

Conclusion

It is concluded that cervical length assessment at 22 weeks gestation presents a valuable predictor for preterm birth incidence within this cohort. The study highlighted a significant correlation between a cervical length of 25 mm or less and an increased risk of preterm delivery. These findings emphasise the potential utility of routine cervical length evaluations in identifying individuals at higher risk, allowing for targeted interventions and improved prenatal care strategies to mitigate the risk of preterm birth and enhance maternal-fetal outcomes.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

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Coordination of collaborative efforts.

Conception of Study, Development of Research Methodology Design, Study Design., Review of manuscript, final approval of manuscript

WAGMA HAQ (Senior Registrar, FCPS)

Manuscript revisions, critical input.

Coordination of collaborative efforts.

FOQIA AWAN (Consultant)

Data acquisition, analysis.

Data entry and Data analysis, drafting article

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Data acquisition, analysis.

Coordination of collaborative efforts.

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