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CERVICAL LENGTH MEASUREMENT BETWEEN 24 AND 28 WEEKS OF GESTATION TO PREDICT THE RISK OF LATE AND POST-TERM PREGNANCY

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ABSTRACT

Background: Late-term and post-term pregnancies are associated with increased perinatal morbidity and mortality. Identifying predictive factors is crucial for mitigating adverse outcomes. **Objective:** This study evaluates whether cervical length measured between 24 and 28 weeks of gestation predicts late and post-term pregnancy. **Methods:** A prospective cohort study was conducted at Al-Immamein Al-Kadhimaein Medical City, enrolling 100 singleton pregnant women. Cervical length was measured at 24-28 weeks, and gestational outcomes were recorded. Late and post-term pregnancies were defined as those extending beyond 42 weeks (≥294 days from the last menstrual period). **Results:** The mean maternal age was 24.4 ± 4.1 years, with a BMI of 26.9 ± 6.2 kg/m². Among participants, 18.0% had late/post-term pregnancies. Cervical length at 24-28 weeks averaged 33.6 ± 5.5 mm and was significantly longer in late/post-term pregnancies (36.7 ± 5.4 mm, $p < 0.001$). A moderate positive correlation was found between cervical length and gestational age ($R = 0.42$, $p < 0.001$). Fetal malposition was significantly associated with late/post-term pregnancy (50.0%, $p = 0.008$). A cervical length cutoff of 37.08 mm predicted late/post-term pregnancy with 50% sensitivity, 82% specificity, and an AUC of 0.696. **Conclusion:** Cervical length measurement at 24-28 weeks is a valuable predictor of late and post-term pregnancy. A cutoff of 37.08 mm identifies pregnancies at increased risk, aiding clinical decision-making.

KEYWORDS: Cervical length, late-term pregnancy, post-term pregnancy, gestational age, fetal malposition, perinatal outcomes, predictive marker.

Gestational age significantly influences perinatal outcomes. Post-term pregnancy, defined as gestation beyond 42 weeks (≥294 days from the last menstrual period), is associated with increased perinatal mortality and morbidity compared to deliveries at 39-40 weeks.[1,2] Approximately 10% of pregnancies extend beyond term, with global incidence ranging from 4.4% to 14%, and a higher rate of 16% reported in Iraq.[1,2] Early detection is crucial for managing post-term pregnancy, reducing stress for patients and their caregivers. Accurate pregnancy dating is essential to prevent unnecessary interventions. First-trimester ultrasound is the most reliable method for dating pregnancy, reducing misclassification of post-term cases.[3] However, when early ultrasound is not feasible, screening methods such as cervical length measurement can help predict pregnancy duration.[2] Cervical length is a key indicator of labor timing; a short cervix is associated with preterm birth, whereas a long cervix predicts late or post-term pregnancy.[4] Transvaginal ultrasound (TVU) is a highly reliable and reproducible method for assessing cervical length, first highlighted by Frank Andersen in 1990.[5] A deficiency in placental steroid sulfatase, fetal adrenal hypoplasia, anencephaly, genetic predisposition, and abnormalities in cervical remodeling have been associated with post-term pregnancy.[6] Factors such as advanced maternal age, nulliparity, male fetus, white ethnicity, and obesity also increase the likelihood of post-term pregnancy.[2,7] Post-term pregnancy poses risks to both the fetus and the mother. Fetal complications include stillbirth, macrosomia, fetal dysmaturity, meconium aspiration syndrome, and oligohydramnios, which can lead to cord compression and distress.[1,2] Maternal risks include prolonged labor, increased perineal trauma, and a higher likelihood of cesarean delivery.[1] Diagnosis relies on confirming gestational age through last menstrual period records and ultrasound. Management involves either induction of labor or fetal surveillance after 41 weeks.[2] Induction methods include prostaglandins, membrane stripping, or oxytocin, while spontaneous labor may be encouraged by sexual intercourse or acupuncture.[8] Post-term pregnancies

require close monitoring through fetal movement counting, nonstress tests, amniotic fluid assessment, biophysical profiling, and Doppler velocimetry.[1] Cervical length measurement by TVU is the gold standard for assessing labor risk, as it remains unaffected by maternal obesity or fetal positioning.[9] A cervical length of >40 mm is associated with increased cesarean section rates, while a length <25 mm before 28 weeks indicates risk for preterm birth.[10,11] Evaluating cervical length at 24-28 weeks may help predict late and post-term pregnancies, facilitating timely interventions. The aim of this study is to investigate whether cervical length measured between 24 and 28 weeks of gestation can predict the risk of late and post-term pregnancy.

Method

This prospective cohort study was conducted at Al-Immamein Al-Kadhimaein Medical City, Department of Obstetrics and Gynecology, from October 1, 2023, to October 1, 2024. A total of 100 pregnant women were included.

Ethical Considerations

Ethical approval was granted by the Scientific Committee at the Department of Obstetrics and Gynecology, Arab Board for Health Specializations. Verbal consent was obtained from all participants after explaining the study's objectives and ensuring confidentiality.

Study Population

Participants were recruited from an obstetric counseling clinic during antenatal care visits at 24-28 weeks of gestation. Gestational age was determined based on the last menstrual period and confirmed using first-trimester ultrasound crown-rump length measurements.

Inclusion Criteria

- Pregnant women (18-45 years) with singleton pregnancies
- Both nulliparous and multiparous women
- Non-smokers

Exclusion Criteria

- Uncertain gestational age
- Chronic medical conditions
- Multiple pregnancy, polyhydramnios, oligohydramnios
- Ruptured membranes, previous two cesarean deliveries
- Hemoglobin < 8 g/dL
- History of preterm birth or second-trimester abortion
- Fetal malformations or placental abnormalities

Data Collection

Collected data included maternal demographics, BMI, gestational age at birth, family history of post-term pregnancy, parity, fetal malposition at labor, cervical length at 24-28 weeks, gestational duration category (preterm, early-term, full-term, late/post-term), and delivery method.

Ultrasonic Cervical Assessment

Transvaginal ultrasound (5 MHz, Mylab 50, Esaote, Italy) was used to measure cervical length, following To et al.'s methodology. Measurements were taken in a dorsal position with an empty bladder. Three consecutive readings were obtained over three minutes, with the average recorded. Additional observations included cervical funneling and internal os diameter. All ultrasounds were performed by a specialized radiologist.

Outcome Assessment

The primary outcome was the incidence of late/post-term pregnancies (≥41 weeks). Secondary outcomes included evaluating cervical length's predictive accuracy and analyzing maternal and fetal factors influencing late/post-term pregnancy risk.

Statistical Analysis

Continuous variables were summarized as means ± SD or medians (range), while categorical variables were expressed as frequencies and percentages. ANOVA tested differences in cervical length across gestational subgroups. Pearson correlation assessed the relationship between cervical length and gestational age. Logistic regression, the Youden method, and ROC curve analysis determined the optimal cervical length cutoff for predicting late/post-term pregnancy. A p-value <0.05 was considered statistically significant.

RESULTS

In a cohort comprising 100 individuals, the range of age was between 18 and 45 years, the mean age was 24.4 years (± 4.1), with a median of 24.0 years (range: 17.0 - 34.0). The average height and weight were 161.2 cm (± 7.3) and 69.2 kg (± 13.4), respectively, resulting in a mean BMI of 26.9 kg/m2 (± 6.2). Gestational age at birth averaged 38.8 weeks (± 2.0). A notable 12.0% reported a family history of post-term pregnancy. Parity had a median value of 2.0 (range: 0.0 - 4.0), with 14.0% being nulliparous and 86.0% multiparous. Fetal malposition was present in 19.0% of cases. The subgroup analysis of gestation duration revealed 9.0% preterm, 31.0% early-term, 42.0% full-term, and 18.0% late/post-term births. Cervical length measured 33.6 mm (± 5.5). Delivery methods included spontaneous onset of labor (67.0%), induction of labor (14.0%), and cesarean section (19.0%). As in table 1.

Table 1: description of study characteristics.

Characteristic	**N = 100[1]**
Age (years)	24.4 ± 4.1
Median (Range)	*24.0 (17.0 - 34.0)*
Height (cm)	161.2 ± 7.3
Weight (kg)	69.2 ± 13.4
BMI (kg/m^2)	26.9 ± 6.2
Gestational age at birth (weeks)	38.8 ± 2.0
Family history of post-term pregnancy	12 (12.0%)
Parity	2.0 (0.0 - 4.0)
Parity categories	
Nulliparous	*14 (14.0%)*
Multiparous	*86 (86.0%)*
Presence of foetal malposition	19 (19.0%)
The subgroup of duration of gestation	
Preterm (24-36+6)	9 (9.0%)
Characteristic	**N = 100[1]**
Early-term(37-38+6)	31 (31.0%)
Full-term(39-40+6)	42 (42.0%)
Late and Post-term (41-42+6)	18 (18.0%)
Cervical length (mm)	33.6 ± 5.5
Delivery method	
Spontaneous onset of labour	67 (67.0%)
Induction of Labor	14 (14.0%)
Caesarean section	19 (19.0%)
[1]Mean ± SD; Median (IQR); n (%)	

Figure 1 showed the distribution of cervical length measurements among different gestational groups. It can be seen that pre-term and early term was associated with lower cervical length measurements and consequently full-term and late and post-term was on the other side of the spectrum (cervical length of 35 mm and more).

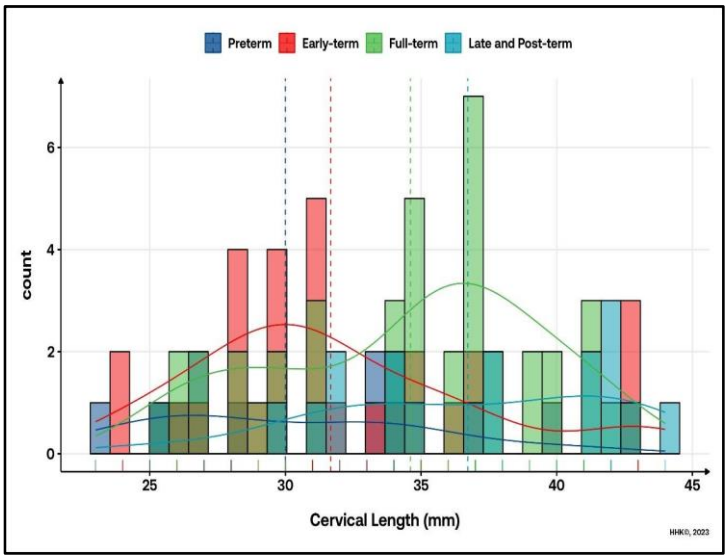

Figure 1: histogram showing the distribution of cervical length among groups based on duration of gestation at birth.

The study stratified participants into four gestational age groups: Preterm (N= 9), Early-term (N = 31), Full-term (N = 42), and Late & Post-term (N = 18). A comparison of characteristics revealed statistically significant differences. The mean age varied across groups (25.0 ± 2.5 for Preterm, 23.8 ± 4.5 for Early-term, 24.3 ± 4.4 for Full-term, and 25.2 ± 3.6 for Late & Post-term), although the differences were not statistically significant (p = 0.7). BMI showed no significant variation (p = 0.3). Notably, fetal malposition was significantly higher in the Late & Post-term group (50.0%, p = 0.008). The presence of a family history did not show significant differences (p = 0.2). Cervical length exhibited a significant increase from Preterm to Late & Post-term groups (28.4 ± 3.9 to

36.7 ± 5.4, p < 0.001). Parity distribution differed significantly (p = 0.037), with multiparous individuals more prevalent in the earlier gestational age groups. As in table 2.

Table 2: distribution of study parameters according to the subgroup of duration of gestation.

Characteristic	Preterm, N = 91	Early- term, N = 311	Full- term, N = 421	Late & Post- term, N = 181	P-value2
Age (years)	25.0 ± 2.5	23.8 ± 4.5	24.3 ± 4.4	25.2 ± 3.6	0.7
BMI (kg/m^2)	24.8 ± 6.4	25.6 ± 6.1	27.6 ± 6.0	28.4 ± 6.6	0.3
Fetal Malposition	1 (11.1%)	4 (12.9%)	5 (11.9%)	9 (50.0%)	**0.008**
Presence of Family Hx.	1 (11.1%)	3 (9.7%)	3 (7.1%)	5 (27.8%)	0.2
Cervical length (cm)	28.4 ± 3.9	31.9 ± 5.3	34.6 ± 4.9	36.7 ± 5.4	**<0.001**
Parity					**0.037**
Multiparous	9 (100.0%)	26 (83.9%)	39 (92.9%)	6 (33.3%)	
Nulliparous	0 (0.0%)	5 (16.1%)	3 (7.1%)	12 (66.7%)	

[1]Mean ± SD; n (%)
[2]One-way ANOVA; Fisher's exact test

The odds ratios (OR) and 95% confidence intervals (CI) were calculated, with the first quartile (Q1) as the reference (cervical length of 23 mm). The second quartile (Q2) showed a notable but non-significant increase in risk (OR = 6.00, 95% CI: 0.93, 118, p = 0.11). The third quartile (Q3) demonstrated a non- significant association (OR = 2.53, 95% CI: 0.23, 56.8, p = 0.5). In contrast, the fourth quartile (Q4) exhibited a significantly higher risk (OR = 14.4, 95% CI: 2.36, 280, p = 0.016) of late and post-term outcomes, suggesting a potential correlation between longer cervical length and increased risk, particularly in the highest quartile. As in table 3.

Table 3: the risk of late and post-term outcome in different cervical length quartiles.

Characteristic	OR[1]	95% CI[1]	P-value[2]
Cervical length quartiles			
Q1 (23 mm) (reference)	—	—	
Q2 (29.75 mm)	6.00	0.93, 118	0.11
Q3 (34 mm)	2.53	0.23, 56.8	0.5
Q4 (37 mm)	14.4	2.36, 280	**0.016**

[1]OR = Odds Ratio, CI = Confidence Interval

Correlation analysis was carried out between cervical length and gestational age using Pearson correlation. A moderate positive correlation existed between the two variables (R=0.42, P-value < 0.001) (figure 2). This finding suggests that as gestational age at birth increases, there is a tendency for cervical length to also increase, emphasizing the potential relevance of cervical length as a factor in predicting gestational age outcomes.

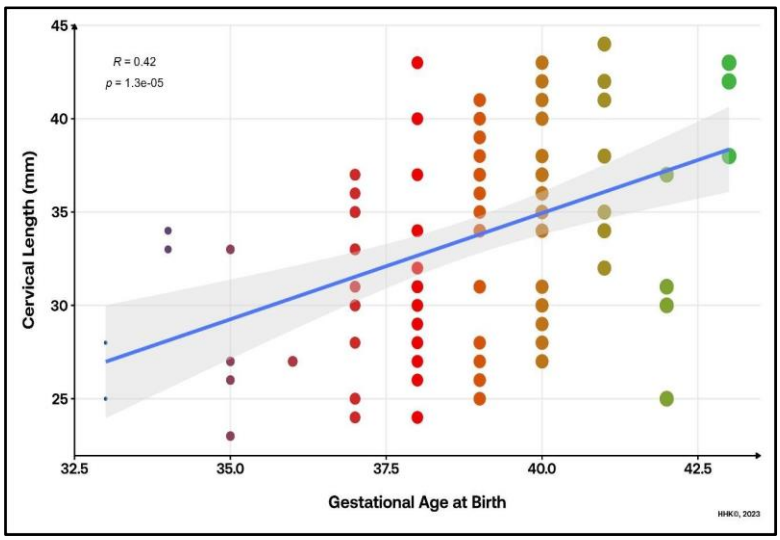

Figure 2: Pearson correlation between cervical length, and gestational age at birth.

The cervical length cut-off point of 37.08 mm, determined by the Youden method, exhibited 50% sensitivity, 82% specificity, and an overall accuracy of 76%. The area under the curve (AUC) was 0.696, indicating a moderate discriminatory ability for predicting relevant outcomes. As in table 4.

Table 4: optimal cut-off points of cervical length for the prediction of late and post-term pregnancy.

Characteristics	Cut-off point	Sensitivity	Specificity	Accuracy	AUC
Cervical length (mm)	37.08	50%	82%	76%	0.696
*Youden method					

DISCUSSION

Preterm births (before 37 weeks) and post-term births (beyond 42 weeks) represent the extremes of gestational age. Despite the relatively high prevalence of post-term pregnancy globally, it has received less research attention than preterm birth.[12] However, post-term pregnancies have been linked to adverse long-term health outcomes in offspring.[13] and increased maternal complications such as cesarean delivery, postpartum hemorrhage, and infections.[14] In this study, the mean age of participants was 24.4 ± 4.1 years, with a mean BMI of 26.9 ± 6.2 kg/m². Similar age and BMI distributions were observed in studies by Kadhim et al.[15] and Ghassan et al.[16] in Iraq, while Salih et al.[17] in Kurdistan reported a higher mean age. Additionally, 12% of participants had a family history of post-term pregnancy, supporting evidence that gestational age has a significant genetic component.[18] Research by Kistka et al.[19] suggests that women with previous post-term pregnancies have a higher risk of recurrence. Parity analysis showed a median of 2.0 (range 0-4), with 14% nulliparous and 86% multiparous. These findings align with studies by Tappis et al.[20] and Al-Kubaisy et al.[21] The gestational duration analysis revealed 9% preterm, 31% early-term, 42% full-term, and 18% late/post-term births, consistent with previous studies reporting post-term pregnancy incidence at 7% globally.[22] Vayssière et al.[23] noted that 15–20% of pregnancies in France reach 41 weeks, with 1% classified as post-term. Similarly, Mengesha et al.[24] in Ethiopia reported a 6% post-term rate, while Mitao et al.[25] observed an 11.4% rate with a 14.8% recurrence risk. These differences may be influenced by maternal demographics, obesity rates, and genetic predispositions.[26] Fetal malposition was observed in 19% of cases, significantly higher in the late/post-term group (50%, $p = 0.008$). Previous research indicates that fetal malposition affects 33–58% of labors, persisting in 12–22% until delivery.[27] Similar findings were reported by Barrowclough et al[28], who documented a 32% fetal malposition rate. The average cervical length (CL) in this study was 33.6 ± 5.5 mm, increasing significantly from preterm to late/post-term pregnancies (28.4 ± 3.9 to 36.7 ± 5.4 mm, $p < 0.001$). Women with CL in the highest quartile (≥37.08 mm) had a significantly higher risk of late/post-term pregnancy (OR = 14.4, $p = 0.016$). A moderate positive correlation was found between CL and gestational age ($R = 0.42$, $p < 0.001$). The optimal CL cutoff for predicting post-term pregnancy was 37.08 mm, with 50% sensitivity, 82% specificity, and an AUC of 0.696. Similar associations between longer CL and prolonged pregnancy were observed by Al-Bayati et al[29], who found a strong correlation ($R = 0.89$, $p < 0.005$) between CL at 37 weeks and gestational age at delivery. Soysal et al.[30] reported that a CL >35 mm at 24-28 weeks increased the risk of late/post-term pregnancy 5.8 times ($p < 0.001$). Boelig et al.[31] found that a CL ≥37 mm at 18-24 weeks doubled the likelihood of prolonged pregnancy, while Suh et al.[32] observed a positive correlation between CL at 37 weeks and gestational age at delivery, with a 30 mm cutoff for predicting prolonged pregnancy. Ramanathan et al.[33] suggested that measuring CL at 37 weeks can help predict spontaneous delivery and the need for cesarean section in prolonged pregnancies. Differences in CL trajectories may account for variations in study findings. While CL generally shortens over pregnancy, individual patterns vary, affecting risk predictions. A slower rate of cervical shortening may contribute to post-term pregnancy risk.[34] These findings highlight the potential utility of CL measurement in assessing late and post-term pregnancy risk, guiding clinical decision-making.

CONCLUSION

The study highlights the significance of cervical length measurement between 24 and 28 weeks of gestation in predicting late and post-term pregnancy risk: Cervical length assessment during mid-pregnancy has been shown to be a reliable predictor of late and post-term pregnancy. Results indicate a moderate positive correlation between cervical length and gestational age, with longer cervical lengths linked to an increased likelihood of late and post-term births. A cervical length threshold of 37.08 mm has been identified as a potential marker for recognizing pregnancies at higher risk of prolonged gestation.

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