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Measuring Cervical Length and Uterocervical Angle as a Tool to Predict Preterm Labor in Pregnant Women

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ABSTRACT

Background: Preterm birth is one of the most important obstetric problems. According to the American College of Obstetricians and Gynecologists (ACOG), preterm delivery accounts for 70% of early neonatal deaths and 25–50% of infant deaths aged less than one year. Data from several studies suggest that preterm labor can be predicted by assessing cervical conditions such as cervical length (CL), and fetal fibronectin.

Objectives: The goal of the current study was to evaluate and contrast the uterocervical angle and cervical length as early preterm delivery predictors for delivery in patients with uterine contractions.

Patients and methods: An upcoming observational cohort study performed on 70 pregnant women who were between 28 and 37 (31.5 ± 2.7) weeks of gestation at risk of preterm labor. The mean cervical length was 36.8 ± 10.8 mm and the mean uterocervical angle was 100.7 ± 26.1 degree. While, the study excluded patients accompanied by placenta previa or any diseases involving contact bleeding, such as endocervical polyp, infection, or bleeding disorders.

Result: The most common risk factor in the studied group was polyhydramnios and previous history of preterm labor respectively. We found that the cut-off points of cervical length and uterocervical angle were < 35.5 mm and ≥105 degree respectively. The study showed that cervical length was superior to utero-cervical angle in the impending preterm birth prediction labor.

Conclusion: When preterm labor is imminent, both the utero-cervical angle and the cervical length can be measured as helpful tools for forecasting preterm birth.

Keywords: Cervical length, Uterocervical angle, Possible preterm labor.

INTRODUCTION

One of the most significant obstetric issues is preterm birth. Preterm birth is responsible for between 25 and 50% of newborn deaths under one year old and 70% of early neonatal deaths as The American College of Obstetricians and Gynecologists (ACOG) says. The prevalence of preterm birth in the US is 12%, which is similar to the incidence at our center. The World Health Organization claims that spontaneous preterm labor causes nearly half of all premature births [(1)]. Preterm labor that is imminent is defined as labor pains that start before 37 weeks, however there are no cervical alterations. Around 25–30% of premature labor situations result in preterm birth [(2)].

According to data from multiple research, cervical parameters like cervical length can be used to predict premature labor (CL) and fetal fibronectin [(3, 4, 5)]. As part of managing preterm labor, ACOG advises sonoelastography as one recent tool for determining the threat of premature labor [(6)], shear wave velocity or the force impulse of the acoustic radiation [(7)], and the biometry of the fetal adrenal gland, all have been documented [(8)]. These methods, meanwhile, necessitate cutting-edge technology and are inappropriate for widespread application.

In the second trimester of pregnancy, transvaginal ultrasonography (TVS), which has been reported as a high-performance screening method for pregnancy, is another innovative cervical assessment that measures the uterocervical angle (UCA) [(9, 10)]. Additionally, it has been demonstrated that the UCA gets worse after a vaginal pessary is inserted in patients who are susceptible to spontaneous preterm birth [(11)]. It is a low-cost, simple method that is safe for both mother and fetus. However, there is currently no evidence to support the use of UCA measurement in the management of upcoming preterm labor [(9, 12)].

Our study's objective was to assess and contrast the sensitivity of cervical length and uterocervical angle as a technique to precisely predict preterm birth in people who were experiencing uterine contractions.

PATIENT AND METHODS

Seventy pregnant women who visited the Obstetrics and Gynecology Department, Faculty of Medicine, Zagazig University, and Al-Sahel Teaching Hospital in Egypt between April 2022 to October 2022 participated in this prospective-observational cohort study. After obtaining the consent of participants, demographic data were collected. Images were taken by 2 ultrasound machines [Siemense Acuson NX2 Elite (7.5 – 10 MHz transvaginal probe) and Mindray DC 70 expert (7.5 – 10 MHz transvaginal probe)] (Figure 1).

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Figure (1): The 2 ultrasound machines

Transvaginal ultrasound was utilized to evaluate any cervical distortion of its position, the transducer used to measure the cervical length was positioned in the vagina about 3 cm proximal to the cervix. This allows for a sagittal view of the cervix with the echogenic endocervical mucosa along the length of the cervical canal. Then, calipers were used to measure the cervical canal's distance from the cervical wall's furthest point of juxtaposition (Figures 2 & 3).

Figure (2): Cervical length in pregnant women 33 weeks with threatened preterm labor measuring 33.4 mm

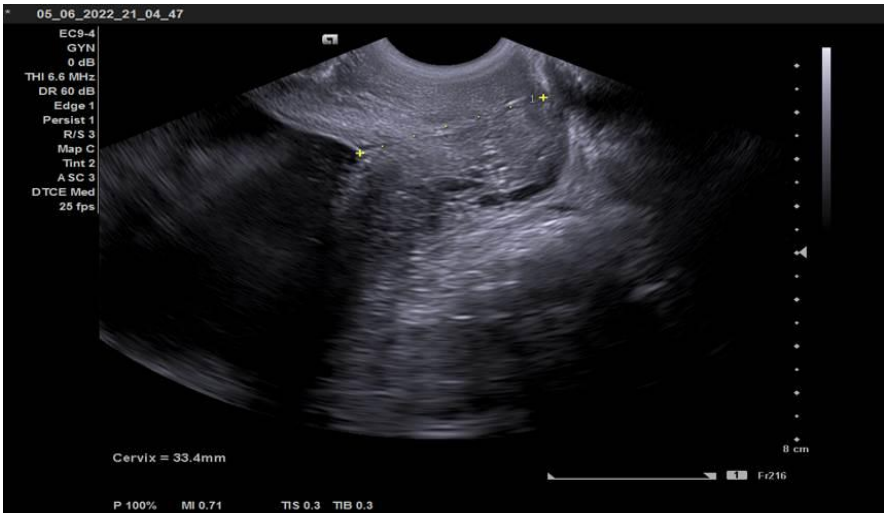

Figure (3): CL in 30 weeks pregnant woman with risk of preterm labor measuring 29.8 mm

Uterocervical angle was measured using the **Dziadosz *et al.*** [10] method. A first line from the internal os to the external os was drawn, regardless of whether the cervix was straight or curved. Internal lining of the endocervical canal and external os are touched by the anterior and posterior cervix walls where the calipers are situated. The lower uterine portion was then separated by a second line. This beam was followed along the anterior uterine section as far as the preloaded image would allow. To get an accurate measurement, the lower uterine region should receive a 3 cm extension of the second ray. The angle created by the two lines is the UCA measurement (Figures 4 & 5).

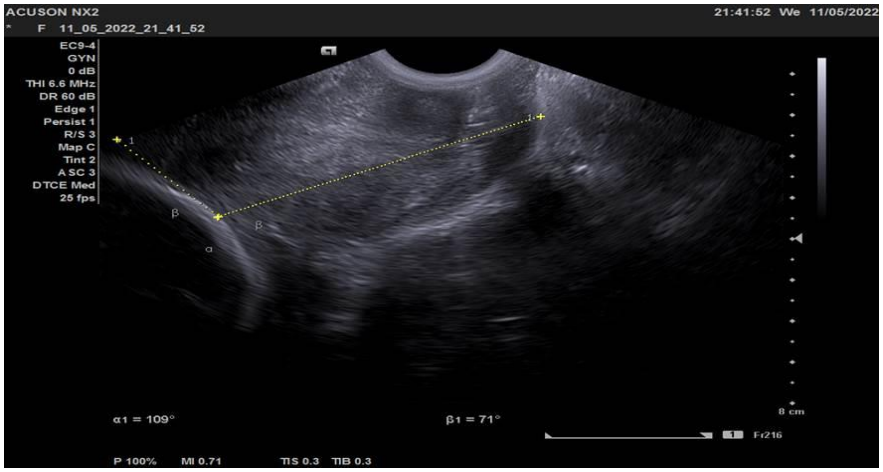

Fig. (4): UCA in 29 weeks pregnant woman with risk of PTL measuring 109 degree.

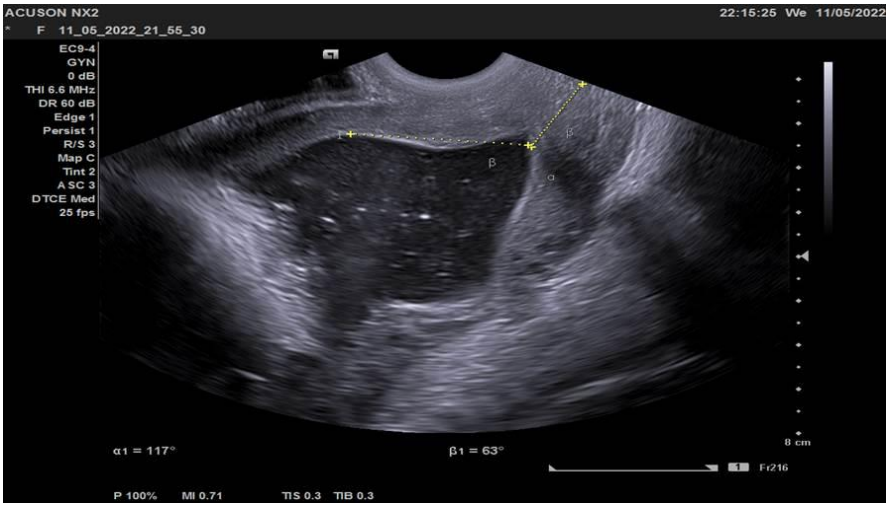

Fig. (5): UCA in 31weeks pregnant woman with risk of PTL measuring 117 degrees.

Outcome:

Maternal outcomes were followed up as regards timing of delivery, mode of delivery, relation of multiple risk factors to timing of delivery. Fetal outcomes were also recorded as regards incidence of transient admission to the neonatal intensive care unit (NICU), respiratory distress syndrome (RDS), and tachypnea of newborns (TTN) for term comparison and preterm babies in relation to cervical length and uterocervical angle.

Ethics approval:

Before starting the study, permission was obtained from Institution Review Board (IRB) (#ZUIRB 9079-4/1/2022), Faculty of Medicine, Zagazig University. All of the subjects' written informed permissions were obtained. The Helsinki Declaration, the World Medical Association's rule of ethics for human research, was followed throughout the study's procedure.

Statistical analysis

Statistical analysis of the data was performed using the IBM SPSS statistical software (V.22.0; SPSS Inc., Chicago, Illinois, USA for windows) and continuous data were presented as mean ± SD with 95% CIs. Spearman's correlation was used to measure the strength and direction of correlation between iron status and vitamin D levels with significance at $P \leq 0.05$.

RESULT

Figures (6 & 7) showed that the average gestational age at delivery was 36.2 ± 2.5 ranging from 28 to 37 (weeks), more than half of the studied group had C.S (65.7%), 40.0% had preterm babies and 70.0% of the studied group didn't need hospital admission**.**
Figures (8-10) showed that there was a statistically significant lesser cervical length among preterm babies than term ones. Regarding the utero-cervical angle, preterm and term newborns had no statistically significant differences.

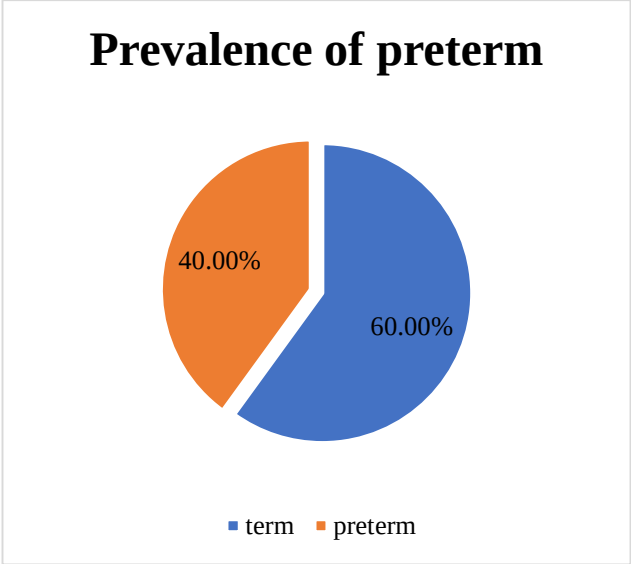

Fig (6): Pie chart for the prevalence of preterm among the studied group.

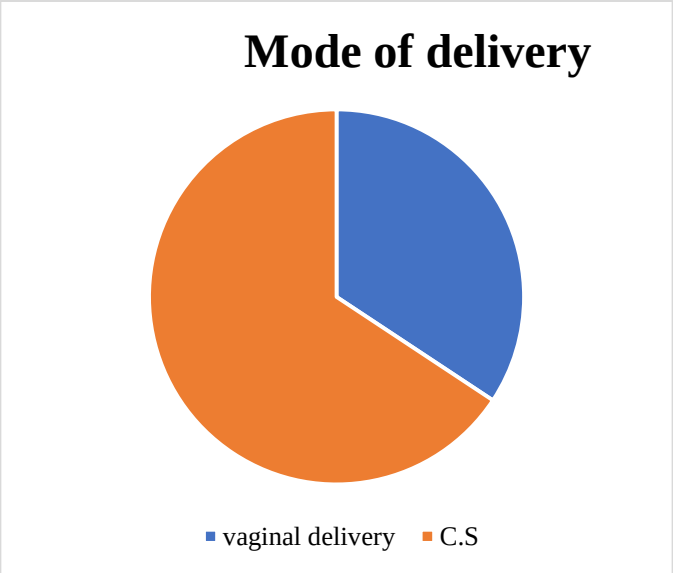

Fig (7): Pie chart for the mode of delivery among the studied group.

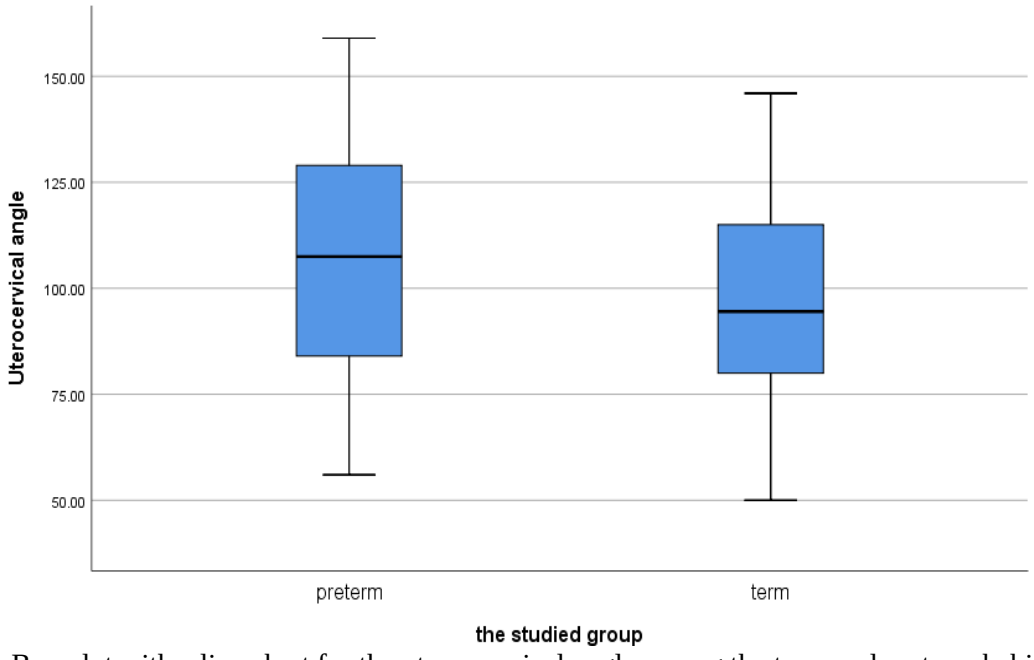

Fig (8): Box plot with a line chart for the utero-cervical angle among the term and preterm babies

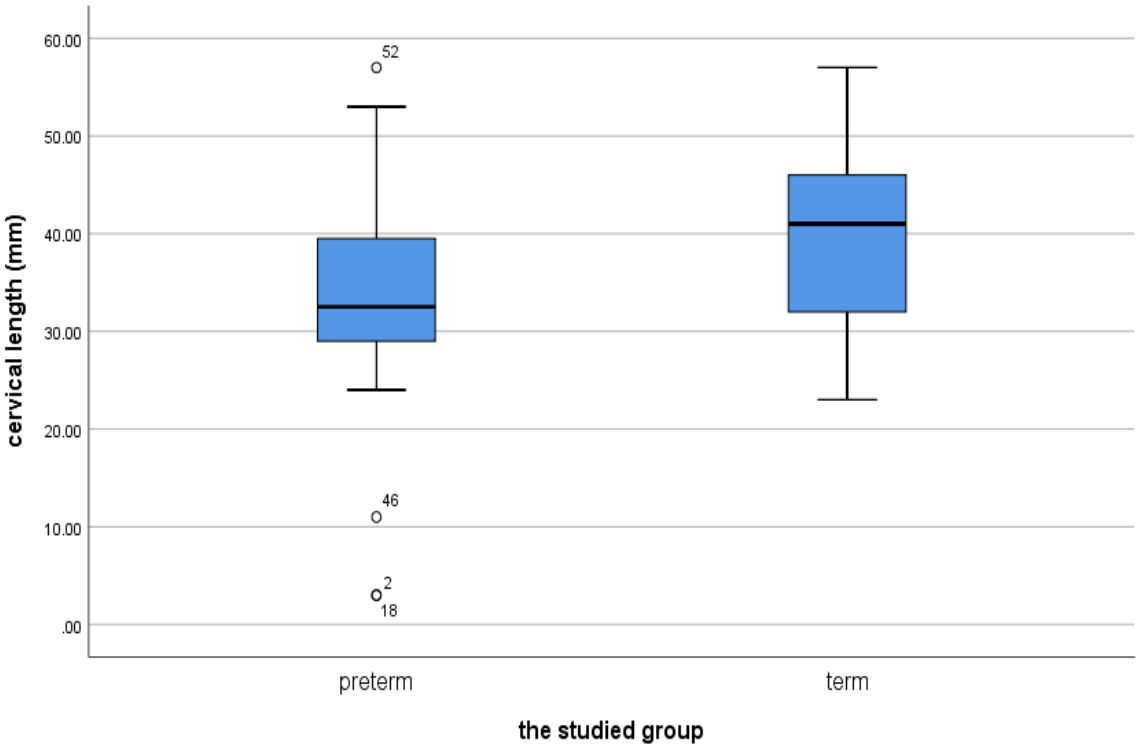

Fig (9): Box plot with a line chart for the cervical length among the term and preterm babies.

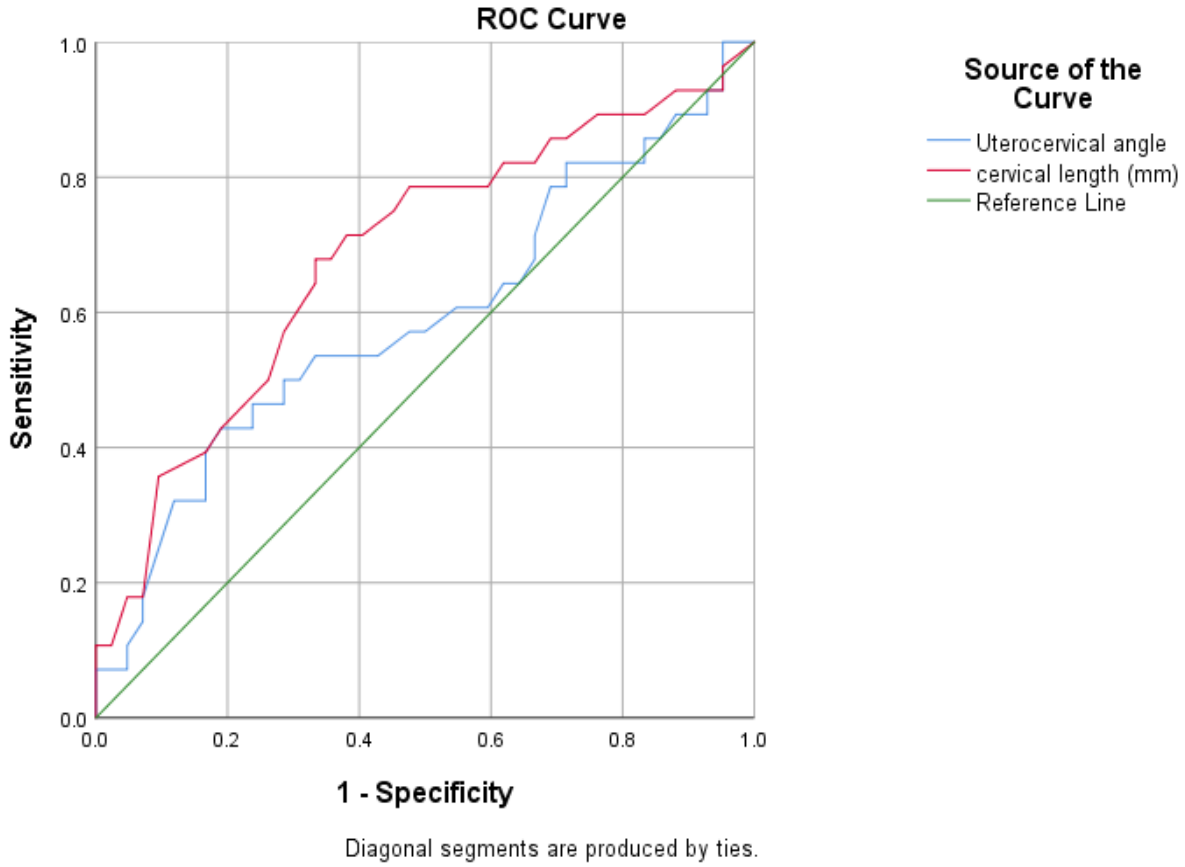

Fig. (10): ROC curve for the diagnostic ability of cervical length and utero-cervical angle to predict preterm labor.

Table (1) showed that the sensitivity and specificity of cervical length and uterocervical angle were 67.9% & 66.7% and 64.3% & 39.1% respectively. Positive predictive value was 57.6% & 40.9% respectively. Negative predictive value was 75.7% & 61.5% respectively and accuracy was 67.1% & 58.6% respectively.

Table (1): The diagnostic ability of cervical length and uterocervical angle to predict preterm labor

Variables	Sensitivity	Specificity	PVP	PVN	Accuracy
Cervical length (mm)	67.9%	66.7%	57.6%	75.7%	**67.1%**
Utero-cervical angle	64.3%	39.1%	40.9%	61.5%	**58.6%**

DISCUSSION

Regarding pregnancy outcome among the studied group, we discovered that the typical gestational age at birth was 36.2 ± 2.5 ranging from 28 to 39 (weeks), more than half of the studied group had C.S (65.7%), 40.0% had preterm babies and 70.0% of the studied group didn't need hospital admission.

The present investigation revealed a statistically significant decline in gestational age at delivery, a higher percent of vaginal delivery, a higher percent of TOP, and a higher percent of NICU admission among preterm babies than term ones. In agreement with our results, **Khamees *et al.*** [13] found that the delivery methods were the same for both the term and preterm groups, with no obvious distinctions. 52% of those who were examined cases delivered via CS. Also, **Makled *et al.*** [14] revealed that there were no statistically significant variations in the two groups' delivery strategies (p = 0.21). However, the gestational age at delivery rose statistically significantly and survival among term babies than preterm ones.

Comparison between the term and preterm babies regarding the utero-cervical angle and cervical length found that the cervical length was statistically significantly shorter among preterm babies than term ones, while regarding the utero-cervical angle, preterm and term did not differ statistically significantly from one another babies. Binary logistic regression showed that cervical length was statistically significant predictor factors for preterm labor. **Gründler *et al.*** [15] reported that CL but not UCA was a significantly associated with the incidence of preterm labour. Similarly, **Makled *et al.*** [14] revealed that in terms of UCA, statistically meaningful variations existed between women who spontaneously went into preterm labor and those who had term births (p =0.015) and cervical length (p =0.018). The preterm group's mean UCA in the second trimester surpassed that of the control group in size. In addition, preterm births were associated with shorter cervical lengths than term births. Also, **Reyna-Villasmil *et al.*** [16] revealed considerable greater UCA levels were displayed by the patients in the preterm group (108.1 ± 5.7º) compared to the patients in term group (100.9 ± 2.6º, p < 0,0001). However, patients in preterm group (17.7 ± 5.4 millimeters) exhibited noticeably lower CL values in comparison with patients in the term group (34.9 ± 5.7 millimeters, p < 0,001).

We used ROC curve analysis to examine the precision with which utero-cervical angle and cervical length predict premature birth, and we discovered that the cut-off positions for both measurements were < 35.5 and ≥ 105 respectively. The sensitivity and specificity of uterocervical angle and cervical length were 67.9% & 66.7% and 64.3% & 39.1% respectively, positive predictive value was 57.6% & 40.9% respectively, negative predictive value was 75.7% & 61.5% respectively and accuracy was 67.1% & 58.6% respectively. **Khamees *et al.*** [13] exhibited a PPV of 42.5%, a NPV of 92.8%, a specificity of 60.4%, and a sensitivity of 86.1% for a UCA of 105° or higher. A CL of 25 mm or below exhibited a 27.8% sensitivity, an 85.8% specificity, a 40.0% PPV, and a 77.8% NPV. Both showed a sensitivity of 25.0% when combined, a NPV of 78.4%, PPV of 52.9%, and specificity of 92.5%. The disagreement may be due to the difference in inclusion criteria and differences in the time of TVUS. Furthermore, **Dziadosz *et al.*** [10] reported that UCA of ≥ 95º was significantly associated with sPTB < 37 weeks with sensitivity of 80% (p<0.001, CI 0.70-0.81, NPV 95%). A UCA of ≥105 o predicted sPTB < 34 weeks with sensitivity of 81% (p<0.001, CI 0.72-0.86, NPV 99%). CL ≤ 25 mm significantly predicted sPTB < 37 weeks (p<0.001, sensitivity 62%, NPV 95%) and <34 weeks (p<0.001, sensitivity 63%, NPV 97%).

There are various limitations to this study. Since the sample size for this study was estimated to determine the sensitivity of UCA and CL in predicting PTL, a larger sample size would be necessary to distinguish between the TVS-UCA of preterm and term birth groups. Due to this, the UCA and CL values in this experiment had a non-normal distribution.

CONCLUSION

We concluded that maternal age, higher gravidity, high parity, cervical length, and mode of delivery were statistically significant predictor factors for pregnancy labor. Additionally, Preterm birth risks can be predicted using both UCA and CL, and support doctors' choices on the administration of tocolytic drugs during threatened premature labor. Our findings need to be confirmed by more comparative research with larger sample sizes and longer follow-up in order to pinpoint additional preterm birth risk factors.

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- **Conflicts of interest:** No conflicts of interest, according to the authors.

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