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Evaluation of Uterocervical Angle in the Second Trimester to Predict Spontaneous Preterm Birth

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Abstract
The uterocervical angle has been proposed as an ultrasound marker to predict spontaneous preterm birth (sPTB). The aim of this article was to evaluate uterocervical angle (UCA) measured at second trimester of gestation using transvaginal sonography (TVS) as predictors of sPTB In this prospective observational study 122 singleton pregnant women between 12 and 24 weeks were enrolled. A transvaginal ultrasound (TVS) was performed to measure the anterior uterocervical angle (UCA) and compared with preterm (<37 weeks) or term (>37 weeks) birth. The mean age of the patients was 26.02±3.70 years (range: 19-35 years). Majority of the cases (69.7%) were term delivery (>37 weeks) and 30.3% of cases were pre-term delivery (<37 weeks). Most of the cases (69.7%) cases had Uterocervical Angle measurement were <95 degree and 30.3% cases had Uterocervical Angle measurement >95 degree. UCA measurement in the second trimester was wider in the preterm group (97.22±8.46 degrees) compared with term group (84.22±73.39 degrees) (p<0.001). Among preterm group 35.1% cases of LSCS and 54.9% cases of Normal Delivery, statistically not significant (p>0.05). Out of total preterm delivery cases 27% baby were (1.5-2 kg) and 70.3% cases of baby were birth weight of 2.1-2.5 kg, association were statistically significant (p<0.05). Risk of spontaneous preterm birth was linked to a wide UCA found during the second trimester. The UCA can be utilized as a screening tool for spontaneous preterm birth

INTRODUCTION

Preterm birth (PTB) is de ned as childbirth occurring at <37 completed weeks or 259 days of gestation and is a major determinant of neonatal mortality and morbidity in developing countries[1]. 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[2]. The prediction of preterm labor plays a crucial role in avoiding premature births and related complications. However, there is still no precise predictive tool[3]. Many factors underlying the risk of PTB in a pregnant woman include maternal history, obstetric ultrasound findings-such as a short cervix, vaginal micro biome and genetics[4-5]. Many obstetricians have proposed that Sonographic assessment of cervical structure by measuring cervical length (CL) has been used as a popular predictive tool to predict preterm labor. The uterocervical angle (UCA) is defined as the angle between the lower anterior uterine segment and the endocervical canal. Recently, UCA has been suggested as an alternative to CL to predict preterm birth[6]. A large UCA was assumed to be connected with a more direct, linear discharge of uterine contents onto the cervix., ma smaller UCA, on the other hand, results in a lesser direct force on the internal os,   which may be protective against cervical deformation[8]. During pregnancy, a transvaginal sonographic examination (TVU) can be used to check for UCA. According to a prior study, UCA is linked to the gestational age at delivery[9]. Measurement of utero-cervical angle is used by one of the most effective interventions in preventing spontaneous PTB[10].

Aims and Objectives: To determine uterocervical angle by transvaginal sonography in second trimester of pregnancy for prediction of spontaneous preterm birth in low-risk singleton pregnant women

MATERIALS AND METHODS

This Prospective Observational study was carried out in the Department of Obstetrics and Gynaecology, Kamla Raja Hospital, G.R.M.C, Gwalior, M.P during a period of January 2021-June 2022.

Inclusion Criteria:

* Patients of 12-24 week of gestation
* Singleton pregnancy
* Patients who provide written informed consent for the study

Exclusion Criteria:

* Cases of multiple pregnancies,

* Polyhydraminos, Uterine anomaly, Fibroid, Placenta previa
* History of previous 2nd Trimester abortion and preterm Birth
* Patients not willing for the study

Total of 122 singleton pregnant women who are at low risk for preterm birth at gestational age between 12-24 week who presented at the antenatal clinic were enrolled in this study.

Participant's demographic data recorded. Potential risk factors for spontaneous preterm birth including underlying disease and obstetric complications are followed until delivery when the mode of delivery, onset of labour and gestational age of baby is recorded.

The uterocervical angle was measured by transvaginal sonography measurement method defining the lower uterine segment and cervical canal as a traingular picture.

Statistical Analysis: Data was analyzed using SPSS software version 22. Mean and standard deviation were calculated for quantitative variable and frequency and percentage for qualitative or categorical variables. Measure the association for categorical dataset were analysed using Chi-Square test. $P<0.05$, considered as statistically significant.

RESULTS AND DISCUSSIONS

A total of 122 singleton pregnant women at gestational age between 12-24 weeks were enrolled
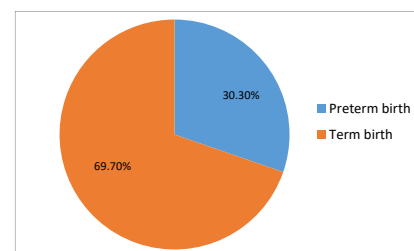
Graph 1: Distribution of study subject on the basis of Term/Preterm birth
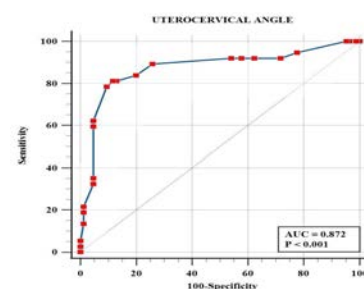
Graph 2: ROC plot for uterocervical angle with area under the ROC curve being 0.872 (p <0.001, standard error: ±0.0407, 95% confidence interval: 0.800-0.926).

Table 1: Association of Uterocervical Angle and spontaneous preterm birth

Uterocervical Angle	Preterm birth	Term birth	p-value
< 95 degree	8 (21.6%)	77 (90.6%)	0.000
95-105 degree	22 (59.5%)	7 (8.2%)	
>105 degree	7 (18.9%)	1 (1.2%)	
Total	37 (100%)	85 (100%)	
Mean±SD	97.22±8.46	84.22±73.39	

Table 2: Association between Maternal variables and Preterm birth

Socio-demographic variables	Preterm birth		Term birth	p-value
Age in year	19-25	21 (56.8%)	46 (54.2%)	0.941
	26-30	11(29.7%)	28 (32.9%)	
	>30	5 (13.5%)	11 (12.9%)	
Booking status	Booked	6 (16.2%)	12 (14.1%)	0. 764,
	Unbooked	31 (83.8%)	73 (85.9%)	
Referral Status	Referred	6 (16.2%)	9 (10.6%)	0. 384,
	not referred	31 (83.8%)	73 (89.4%)	
Gravida Status	G1	23 (62.2%)	55 (64.7%)	0. 786
	G2	10 (27%)	24 (28.2%)	
	G3	4 (10.8%)	6 (7.1%)	
Mode of Delivery	LSCS	13 (35.1%)	36 (42.4%)	0. 455
	Normal delivery	24 (54.9%)	49 (57.6%)	

Table 3: Correlation of Birth weight of Baby and pre term delivery

Birth weight (kg)	Preterm birth	Term birth	p-value
1.5-2.0 kg	10 (27%)	0 (0%0	0. 000
2.1-2.5 kg	26 (70.3%)	43 (50.6%)	
2.6-3.0 kg	1 (2.7%)	40 (47.1%)	
3.1-3.5 kg	0 (0%)	2 (2.4%)	
Mean±SD	2.13±0.26	2.58±0.28	

and analysed in this study. The mean age of the patients was 26.02±3.70 years (range: 19-35 years). Majority of the cases (69.7%) were term delivery (period of gestation >37 weeks) and 30.3% of cases were pre-term delivery (period of gestation <37 weeks).

Most of the cases (69.7%) cases had Uterocervical Angle measurement were <95 degree and 30.3% cases had Uterocervical Angle measurement >95 degree. Uterocervical Angle measurement in the second trimester was wider in the preterm group (97.22±8.46 degrees) compared with term group (84.22±73.39 degrees) (p<0.001).

There are no statistically significant association between age and term/preterm delivery in terms of maternal age, booking status and referred status (p>0.05). Majority of the cases (62.2%) were primigravida (G1). Among preterm group 35.1% cases of LSCS and 54.9% cases of Normal Delivery, statistically not significant (p>0.05)

Out of total preterm delivery cases 27% baby were 1.5-2.0 kg and 70.3% cases of birth weight of baby were 2.1-2.5 kg whereas among term delivery 50.6% cases of birth weight of baby were 2.1-2.5 kg and 47.1% cases of birth weight of baby were 2.63.0 kg, association were statistically significant (p<0.05).

On receiver operating characteristic (ROC) curve analysis, we found that at an optimal cutoff point of 95 degrees, Uterocervical Angle >95 degrees was a strong predictor of spontaneous preterm birth at 37 weeks period of gestation with area under the ROC curve being 0.872.

UCA, which presents the angle between the anterior uterine wall and cervical canal, is a newly used ultrasonographic parameter for predicting many obstetric outcomes such as preterm birth, labor induction, pregnancy termination, the success of cerclage, dysmenorrhea, polyhydraminos, and unexplained infertility[11-12].

In our study 56.8% female delivered at pre-term and 54.2% delivered at term were 19-25 years of age group, statistically, the mother age showed insignificant difference in comparison between the two groups, similar finding observed by Makled[13] and Nguyen[14].

We have observed that no statically significant difference between preterm and term delivery in respect to parity and mode of delivery, consistent finding reported by Luechathananon[15].

Incidence of spontaneous preterm delivery was 30.3% in the present study, concordance with the Sur[16] and Llobet[17].

The study showed a significant difference of mean UCA in 2nd trimester between women who delivered preterm and that of those who delivered at term (p<0.05), our results comparable with the other studies: Sochacki Wójcicka[18] and Sisecioglu[19].

In our study the risk of spontaneous preterm birth was higher in women with obtuse UCA (>95 degrees), in agreement with the many other studies like: Goldstein[20] and Malik[21].

A study done by Nguyen[22] observed that UCA values in women with sPTB is wider than that in women with term delivery. Preterm birth rates are increased in women with obtuse uterocervical angles. Dziadosz[23] reported that uterocervical angle >95 degrees and >105 degrees was a significant predictor of spontaneous preterm birth before the completion of

37 weeks and 34 weeks, respectively, with sensitivity level of about 80%.

A wide UCA detected during the second trimester is associated with an increased risk of spontaneous preterm labor. The rationale behind this association is based on the mechanical properties of the UCA. An acute UCA acts as a preventive mechanical barrier against sPTB.

Current study found that UCA in the range 95 to 105 degrees was found to be significantly associated with sPTBs at 34-37 weeks with a sensitivity of 78.1%, specificity of 93.7% and p<0.001, our finding correlate with the Zhang[24].

In a study conducted by Hammam[25] found that the value of Sensitivity of CU angle at a cut off 92.5 was (89.3%), specificity =(76.2%), predictive value for positive (PVP) = (71.4%), predictive value for negative (PVN) = (91.4%) and (81.4%) accuracy.

In present study, out of preterm delivery 27% babies has very low birth weight (1.5-2.0 kg) and 70% babies had birth weight of around 2.0-2.5 kg, similar to study done by PK Singh[26].

CONCLUSION

UCA in the second trimester was significantly wider in the preterm group compared with the term group and there was a significant association between obtuse UCA and risk of spontaneous preterm labor. UCA is a potential novel screening tool for the prediction of sPTB.

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