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## Original Research Article

# Transvaginal ultrasonographic assessment of cervical length in prediction of preterm labour in high risk asymptomatic women

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### ABSTRACT

**Background:** Preterm birth is an important cause of perinatal morbidity and mortality and has long term health implications. Aim of this study was to predict preterm labour by Transvaginal ultrasonographic cervical length measurement in high risk asymptomatic women which may help in decision making in managing these women.

**Methods:** This study was conducted in Department of Obstetrics and Gynecology, Mahathma Gandhi Memorial Government Hospital, Trichy from August 2016 to September 2017 in 130 antenatal women with high risk factors such as prior spontaneous preterm birth, miscarriage. Transvaginal cervical length was measured and Gestational age at which delivery occurred was correlated and results were analyzed.

**Results:** In present study, sensitivity of transvaginal cervical length measurement (cut off cervical length <25 mm) was 70.9% and specificity was 63% in prediction of preterm labour in high risk asymptomatic women. Positive and negative predictive value of cervical length in predicting preterm labour were 63.7 % and 70% respectively.

**Conclusions:** Transvaginal cervical length measurement can be combined with anomaly scan in high risk women to predict preterm labor and is objective, reproducible and cost effective.

**Keywords:** Cervical length, Preterm labour, Transvaginal cervical length measurement

### INTRODUCTION

Preterm birth is defined as delivery after the period of viability and before 37 completed weeks of gestation.<sup>1</sup> Incidence of preterm birth ranges between 10 to 15%. Morbidities due to organ system immaturity are increased in preterm infant and they suffer from immediate complications of prematurity and long-term sequelae such as neurodevelopmental disability.

Risk for preterm labour are threatened miscarriage, extremes of maternal age, low socioeconomic status, low pre-pregnancy weight, obstetric factors such as prior preterm birth, psychological factors, stress and so on.<sup>1,2</sup>

Reduction in preterm delivery can be achieved only when there is a better screening test and availability of

treatment strategies to defer preterm labour. Methods available for prediction of preterm labour include cervical sonography, risk scoring systems, biomarker assay.

Screening test with high sensitivity and positive predictive value would ideally be useful in predicting preterm labour. Several randomized controlled trials suggest that effective screening by measuring cervical length at 23 weeks of gestation and therapeutic intervention with progestins up to 34 weeks could reduce risk of preterm delivery by 42% which would translate into improved perinatal outcome.<sup>3</sup>

### METHODS

This was a prospective observational study conducted in department of Obstetrics and Gynaecology, Mahathma

Gandhi Memorial Government Hospital, Trichy, India from August 2016 to September 2017 to determine correlation between cervical length measured by transvaginal ultrasonography and period of gestation at delivery in high risk asymptomatic women.

#### **Inclusion criteria**

- Multigravida registering before 16 weeks of gestation with high risk factors such as previous two first trimester miscarriages, previous second trimester miscarriage, past history of spontaneous preterm birth.
- Primigravida with history of threatened miscarriage registering before 16 completed weeks of gestation.

Interpregnancy interval less than one and a half years or more than 5 years, evidence of infection such as periodontal disease, urinary tract infection was noted

#### **Exclusion criteria**

- Multiple gestation, Fetal anomaly, Polyhydramnios, induced preterm birth (e.g.) severe preeclampsia, Gestational diabetes, Fetal growth restriction were excluded.

High risk asymptomatic antenatal women were explained the procedure and consent for Transvaginal sonography was obtained. Measurement of cervical length with TVS was done at 16-20 weeks and they were called for follow up after 3-4 weeks.

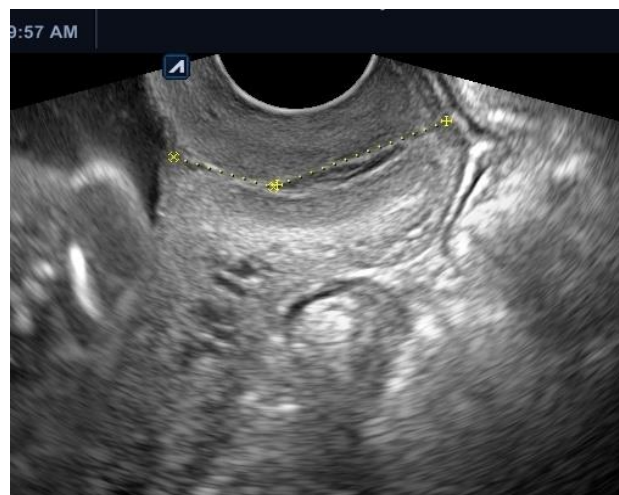
If cervical length was found to be more than 25 mm at 16-20 weeks and 20-24 weeks, further follow up scan was not done. If it was less than 25 mm, antenatal woman was called for follow up scan at 3-4-week interval until 28 weeks.

They were followed up until delivery. 25 mm cut off is taken for defining short cervix as this is the lower 10th centile in unselected and high-risk mothers.

#### **Technique of measurement of cervical length**

Antenatal woman is placed in dorsal position. After getting consent, transvaginal probe covered by lubricated condom is introduced by sonographer. Sagittal image of cervix is obtained. Cervix should occupy 50-75% of screen.

If cervix is not straight, two ends to end straight measurements (Figure 1) must be obtained to measure accurate cervical length. Cervical canal must be equidistant from anterior and posterior cervical wall. 3 measurements are obtained over a period of 3 minutes and shortest best is taken in millimeters.



**Figure 1: Transvaginal ultrasonographic measurement of cervical length.**

#### **RESULTS**

In this study, 130 antenatal women were enrolled among which most of them were multigravida (80%). On analysis of risk factors and their correlation with cervical length and preterm labour occurrence, 26% of women (n-34) had history of more than one first trimester miscarriage, 41% of them (n-14) had cervical length less than 25 mm of which 50% of them delivered preterm. 5% of enrolled mothers (n-7) had history of first trimester miscarriage with periodontal disease, UTI and 3 had cervical length less than 25 mm of which one mother delivered preterm. 7% of enrolled women (n-10) had history of I, II trimester miscarriage and 2.3% (n-3) had history of II trimester miscarriage among which 6 women had cervical length less than 25 mm of which one third (33%) delivered preterm (Table 1).

35% of enrolled mothers (n-46) had history of prior spontaneous preterm labour, of which 65% (n-30) had cervical length less than 25 mm. 73% (n-22) of these mothers with short cervix had recurrent preterm labour. 20% of enrolled mothers (n-26) had threatened miscarriage of which 50% (n-13) had cervical length less than 25 mm and 42% of these women (n-11) had preterm delivery. 2% of enrolled mothers (n-3) had Mullerian anomaly (2 bicornuate, 1 unicornuate uterus) of which one mother had cervical length less than 25 mm and delivered preterm. Another mother had preterm delivery at 35 weeks though her cervical length was 38 mm. 53% of enrolled mothers (n-69) with one or more of these risk factors had cervical length less than 25 mm of which 63% had preterm delivery. 7.6% of enrolled women (n-10) had cervical length of 26-30 mm of which 50% of them delivered preterm. 35.3% of enrolled women (n-46) had cervical length of 30-40 mm of which 25% delivered preterm.

**Table 1: Distribution of antenatal women with risk factors, mean cervical length and cervical length less than 25 mm, preterm labour occurrence.**

RISK FACTOR	Number of cases	Mean cervical length(mm)	Cervical length <25 mm	Number of Preterm labours
I trimester miscarriage with periodontal disease/ interpregnancy interval >5 years /UTI or more than two I trimester miscarriage	41	32.56	17	7
II trimester miscarriage	3	28	1	0
I and II Trimester miscarriage	10	29.2	5	2
Prior one spontaneous preterm birth or with I trimester miscarriage /interpregnancy interval >5 years	46	28.63	30	22
Prior 2 spontaneous preterm birth	1	23	1	1
Threatened miscarriage alone or with UTI/Periodontal disease	26	30.8	13	11
Mullerian anomaly	3	30.5	1	1

3.8 % of enrolled women had cervical length more than 40 mm and two of these women had preterm delivery (Table 2). 68 women came for follow up at 22-24 weeks out of 69 women with cervical length less than 25 mm at 16-20 weeks, of which 66 women had cervical length less than 25 mm.

**Table 2: Correlation of cervical length with gestational age at delivery.**

Cervical length in mm	Number of cases	Preterm labour <37 weeks
<25	69	44
26-30	10	5
31-35	7	1
36-40	39	10
>40	5	2
Total	130	62

In this study, sensitivity of cervical length with a cut off of less than 25 mm in predicting preterm labour in women with these risk factors was 70.9% and specificity was 63.2%. Positive predictive value of the test was 63.7 % which implies among 69 women with short cervical length, 44 had preterm delivery. Negative predictive value of the test is 70.5 % which means of 61 women with cervical length more than 25 mm, 43 women delivered at term (Table 3).

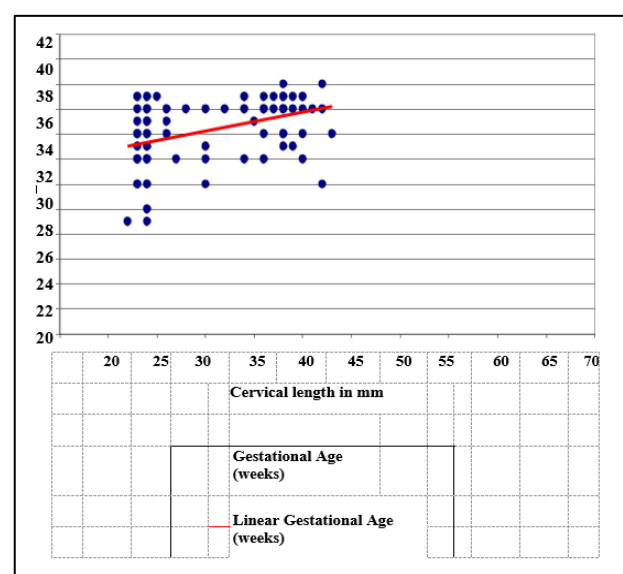
**Table 3: Cervical length and correlation with preterm and term labour.**

Cervical length in mm	Preterm delivery (<37 weeks)	Term delivery (>37 weeks)
< 25 mm (69)	44 (a)	25 (b)
>25 mm (61)	18 (c)	43 (d)
Total	62	68

Sensitivity of short cervical length in prediction of preterm labour is 70.9%. Specificity of short cervical length in prediction of preterm labour is 63.2%.

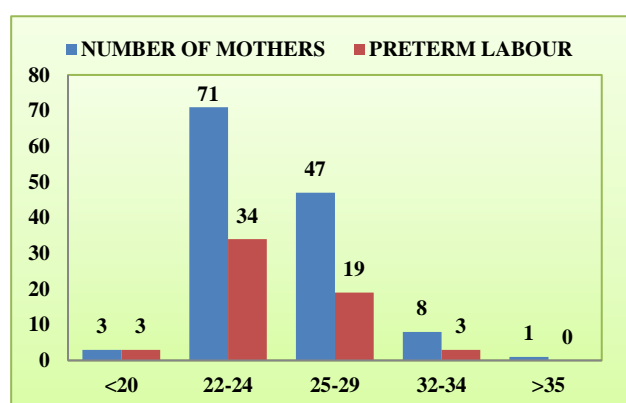
- Positive predictive value-63.7 %
- Negative predictive value-70.5 %
- Percentage of false positive-36.2
- Percentage of false negative-29.0

In this study, clustering of preterm labour was seen in women with cervical length less than 25 mm. (Figure 2) and significant positive correlation is noted between cervical length and gestational age at delivery.

**Figure 2: Correlational of gestational age in weeks with cervical length (mm).**

The mean cervical length measured in this study was 29.45 mm with standard deviation of 6.77 mm and the mean gestational age at delivery was 36.15 weeks with standard deviation of 2.45 and p value of transvaginal cervical length measurement in predicting preterm labour in high-risk asymptomatic women with singleton gestation was 0.001 which is significant. Secondary factors that were analysed in this study were age, BMI, mode of delivery, birth weight of the babies born to mother in study population. On analysis of the enrolled mothers with high risk factors for preterm labour, it occurred commonly in age group less than 20 years followed by age group 20-24 years.

47 mothers were from age group 25-29 years of which 40 % delivered preterm. 9 mothers were above 30 years of which one third delivered preterm (Figure 3). In this study, preterm labour was common in mothers of age group less than 24 years with risk factors.



**Figure 3: Age wise occurrence of preterm labour in study population**

In this study, 3 mothers with BMI less than 20 delivered preterm and majority of mothers (81%) enrolled had BMI of 20-25 and half of them delivered preterm in study population. 11% of mothers enrolled had BMI >25 and 50% of them had preterm delivery (Table 4).

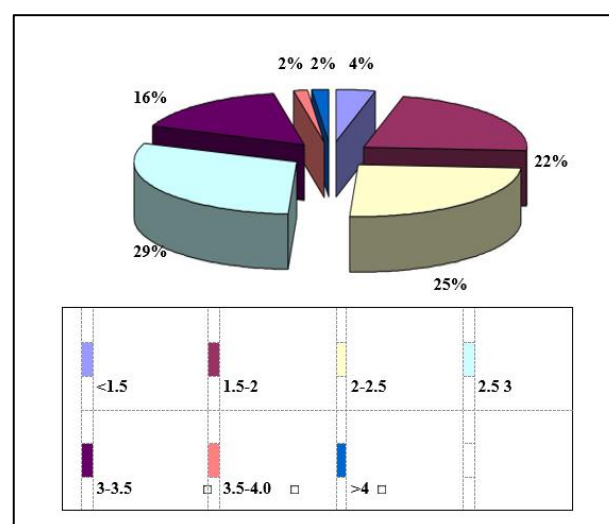
**Table 4: Relation of BMI with occurrence of preterm labour.**

BMI	Number of mothers	Preterm delivery	Term delivery
<20	10	8	2
20-25	106	47	59
25-30	13	7	6
>30	1	0	1
Total	130	62	68

Hence BMI has weak correlation with preterm labour occurrence. When mode of delivery is considered, 82% of women delivered by labour natural, 6% had instrumental delivery, 3% had assisted breech delivery

and 9% were delivered by caesarean section. Analysis of birth weight of babies born to these mothers showed 22% of babies had birth weight of 1.5 -2 kg, 25 % babies in 2-2.5 kg, 29% of babies had birth weight of 2.5 -3 kg and 16 % had 3-3.5 kg.

4 % of babies had birth weight below 1.5 kg and 4% had birth weight above 3.5 kg each. In this study, around one half of the babies born to mother with risk factors for preterm labour had birth weight below 2.5 kg (Figure 4).



**Figure 4: Distribution of birth weight among study population.**

## DISCUSSION

In present study, among women with prior induced or spontaneous miscarriage (n=51), 30 women had short cervical length and 50% of these women had preterm delivery. Visintine et al analyzed cervical length in women with singleton pregnancy and more than one prior induced miscarriage and concluded women with multiple prior induced miscarriage and short cervix had 3.3-fold greater risk of preterm delivery than women with cervical length greater than 25 mm.<sup>4</sup>

In their study, 65 women with more than one induced abortion were analyzed, sensitivity, specificity, positive and negative predictive value of short cervix in prediction of preterm labour were 50%, 84%, 47% and 86% respectively in their study (Table 5).

Crane, Hutchens et al concluded women with history of preterm birth had increased risk of recurrent spontaneous preterm birth and this is predicted by short cervical length (<30mm).<sup>5</sup> In an observational study by Owen et al, 183 women with singleton gestation who previously had experienced a spontaneous birth before 32 weeks gestation were studied.<sup>6</sup>



**Table 5: Comparison of present study with other studies.**

Author	N	Preterm birth	GA studied (weeks)	Cervical length cut off (mm)	Sensitivity	Specificity	PPV	NPV
Singleton: prior miscarriage <sup>4</sup>	65	14	14-24	25	50	84	47	86
Singleton prior preterm birth <sup>6</sup>	183	48	16-24	25	69	80	55	94
Singleton: Mullerian anomaly <sup>9</sup>	64	11	14-24	25	71	91	50	96
Present study: singleton, prior preterm birth, prior I, II trimester miscarriage, threatened miscarriage, Mullerian anomaly	130	62	16-26	25	70.9	63.2	63.7	70.5

Forty-eight women (26%) experienced spontaneous preterm birth before 35 weeks gestation and cervical length of less than 25 mm at the initial sonographic examination was associated with a relative risk (RR) of 3.3 for spontaneous preterm birth. The sensitivity, specificity, positive predictive value of short cervix in predicting preterm labour were 69%, 80%, 55% respectively and they concluded cervical length assessed by endovaginal sonography between 16 weeks and 18 weeks 6 days gestation, augmented by serial evaluations, predicts spontaneous preterm birth before 35 weeks gestation in high-risk women.

In present study, 46 women with history of spontaneous preterm labour were analyzed of which 65% (n=30) had short cervix and 73% (n=22) of them had recurrent preterm birth. Women with threatened miscarriage are at increased risk of preterm delivery. Devon Rameker et al, evaluated contribution of vaginal bleeding and cervical length to risk of preterm labour and found after accounting for cervical length and interaction, the adjusted odds ratio for vaginal bleeding and preterm birth was 4.8.<sup>7,8</sup> In present study, 20% of women had (n=26) threatened miscarriage along with other risk factor such as periodontal disease and urinary tract infection, 50% of these women had cervical length less than 25mm, out of which 86% had preterm birth.

Airolidi et al studied 64 women with uterine anomalies and short cervical length on transvaginal ultrasonography in women with uterine anomalies has a 13-fold risk for preterm birth.<sup>9</sup> The sensitivity, specificity, and positive and negative predictive values of a short cervical length for spontaneous preterm birth were 71%, 91%, 50%, and 96%, respectively.

Unicornuate uterus had the highest rate of cervical shortening and preterm delivery. In present study, 3 women with uterine anomalies were studied of which 2 of them had preterm delivery. The sample size with regard to uterine anomaly in present study is less to draw

conclusion as a separate factor, but this variable was included as a high-risk factor and studied along with other risk factors. In present study, cervical length with cut off of 25mm has 71% sensitivity and 63.2% specificity in predicting preterm labour in high risk asymptomatic women with singleton gestation. Negative predictive value was 70.5% which implies 70% women who had cervical length more than 25mm delivered at term.

63.7% of high-risk asymptomatic women who had short cervical length, delivered at less than 37 weeks gestation which implies a positive predictive value of 63.7 %, which was comparable to 55% (Owen et al) and 48% (Visintine et al). Spontaneous preterm birth increases as length of cervix declines more so with gestational age at which shortening of cervical length detected decreases. In asymptomatic women with singleton pregnancy with high risk factor for preterm labour, transvaginal ultrasonographic measurement of cervical length is predictive of preterm labour.

## CONCLUSION

Preterm delivery has significant contribution to perinatal mortality and morbidity. Transvaginal sonographic determination of cervical length is a useful screening tool for prediction of preterm labour in women with high risk factors such as prior spontaneous preterm birth, prior first trimester, second trimester miscarriage, threatened miscarriage. Compared to biomarkers, transvaginal sonographic cervical length measurement is less expensive, easily accessible, objective, reproducible, acceptable to the patient and can be combined with anomaly scan in women with risk factors for preterm labour.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, Casey BM, Sheffield JS. *Obstetricia de Williams*. McGraw Hill Brasil; 2016 Mar 1
2. SOGC clinical guideline No.257, May 2011: Ultrasonographic cervical length assessment in prediction of preterm labour.
3. O'Brien JM, Defranco EA, Adair CD, Lewis DF, Hall DR, How H et al. Effect of progesterone on cervical shortening in women at risk for preterm birth: secondary analysis from a multinational, randomized, double-blind, placebo-controlled trial. *Ultrasound in Obstet Gynecol.* 2009;34(6):653-9.
4. Visintine J, Berghella V, Henning D, Baxter J. Cervical length for prediction of preterm birth in women with multiple prior induced abortions. *Ultrasound Obstet Gynecol.* 2008;31(2):198-200.
5. Crane JM, Hutchens D. Use of transvaginal ultrasonography to predict preterm birth in women with a history of preterm birth. *J Int Society Ultrasound Obstet Gynecol.* 2008;32(5):640-5.
6. Owen J, Yost N, Berghella V, Thom E, Swain M, Dildy III GA et al. Mid-trimester endovaginal sonography in women at high risk for spontaneous preterm birth. *Jama.* 2001;286(11):1340-8.
7. Davari-Tanha F, Shariat M, Kaveh M, Ebrahimi M, Jalalvand S. Threatened abortion: a risk factor for poor pregnancy outcome. *Acta Medica Iranica.* 2008;46(4):314-20.
8. Ramaeker DM, Simhan HN. Sonographic cervical length, vaginal bleeding, and the risk of preterm birth. *Am J Obstet Gynecol.* 2012;206(3):224-e1.
9. Airoidi J, Berghella V, Sehdev H, Ludmir J. Transvaginal ultrasonography of the cervix to predict preterm birth in women with uterine anomalies. *Obstetrics Gynecol.* 2005;106(3):553-6.

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