

**PREDICTION OF SPONTANEOUS PRETERM BIRTH BY CERVICAL LENGTH MEASUREMENT**<sup>1</sup>Dr. Anju Vijayan, <sup>2</sup>Dr. Beenakumari R. and <sup>3</sup>Dr. Kala B. S.<sup>1</sup>Junior Resident in Obstetrics & Gynecology, Government Medical College, Kottayam.<sup>2</sup>Additional Professor in Obstetrics & Gynecology, Government Medical College, Kottayam.<sup>3</sup>Associate Professor in Obstetrics & Gynecology, Government Medical College, Kottayam.**\*Corresponding Author: Dr. Beenakumari R.**

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**ABSTRACT**

**Introduction:** Spontaneous preterm birth is a global problem leading to significant perinatal morbidity and mortality. Cervical length measurement is one of the methods of prediction of preterm birth. **Materials & Methods:** This prospective observational study was conducted at Department of Obstetrics & Gynecology, Government Medical College, Kottayam, Kerala for 18 months from March 2018. 400 uncomplicated primigravid patients were included. Cervical length was measured at 11-14 weeks and at 20 weeks of gestation. Reduction in cervical length between these two gestations were noted. Patients were grouped into cervical length reduction of < 1 cm and  $\geq$  1 cm. Gestational age at delivery was observed. **Results:** The mean age of the study group was 27.26 years. The rate of spontaneous preterm birth was 21 %. The mean cervical length at 11 – 14 weeks was 3.88 cm and that at 20 weeks was 3.46 cm. Cervical length at 20 weeks and a reduction of cervical length of  $\geq$  1 cm from 11 – 14 weeks were significantly associated with spontaneous preterm birth. Using receiver operative characteristic (ROC) curve analysis at 20 weeks, a cervical length reduction cut off value > 0.6 cm had a specificity of 80.7% and sensitivity of 44.05% in prediction of spontaneous preterm birth. **Conclusion:** The cervical length measurement at 11 – 14 weeks and 20 weeks along with routine obstetric ultrasound can help in identification of patients at risk for spontaneous preterm birth.

**KEYWORDS (MeSH):** Preterm birth; Pregnancy; Cervical length.**INTRODUCTION**

Spontaneous preterm birth (sPTB) is defined as delivery before completing 37 weeks of gestation. Globally every year 15 million babies are born preterm and more than 1 million infant deaths are attributable to prematurity.<sup>[1]</sup> Multiple aetiologies have been proposed, but exact causative factor remains unclear which makes individual risk assessment and prevention difficult. Many preterm births occur in women with no risk factors. Prior preterm birth is found to be the strongest risk factor for future preterm births.<sup>[2]</sup> Strategies to reduce the incidence has led to different methods of prediction of preterm birth. One of the parameters is the measurement of cervical length (CL) by ultrasonography (USG) in the first and second trimester.<sup>[3]</sup>

**MATERIALS AND METHODS**

Study design: Prospective observational study  
Study setting: Department of Obstetrics & Gynaecology (OBG), Government Medical College, Kottayam, Kerala from March 2018 to August 2019 (18 months).

The study included uncomplicated primigravid patients with singleton pregnancy and excellent dates attending outpatient department of OBG at Government Medical College, Kottayam.

All primigravid patients with irregular cycles, medical comorbidities, first trimester bleeding per vaginam, with history of uterine surgeries and multiple pregnancy were excluded from the study. The patients who required induction of labour due to comorbid conditions developed during the course of pregnancy also were excluded.

Sample size was calculated as per study by Carvalho MH et al and was found to be 400. Institutional Review Board (IRB) approval was taken (IRB No. 21/2018). Informed consent was taken from all patients.

Cervical length was measured at Department of Radiodiagnosis in our institution. Transvaginal ultrasound (TVS) was performed using 5 – 7 MHz endovaginal probe after emptying bladder of the patient. Cervical length education and review (CLEaR) technique

was utilised for measurement .The procedure of measurement was as follows.

1. Transvaginal field of view optimised.
2. Anterior and posterior width made equal.
3. Maternal bladder empty.
4. Internal and external os seen.
5. Cervical length visible throughout

Probe was inserted into the vagina till amniotic cavity is visible and then withdrawn slightly until bladder edge is visible. Entire cervical canal is visualised and measurement taken from inner and outer edge. Three measurements were taken and average was reported as cervical length (CL). The CL was taken at 11 – 14 weeks and at 20 weeks of gestation .All patients were followed up till delivery. Delivery before 37 completed weeks of gestation was taken as preterm.

Data was entered into MS Excel and analysed using SPSS 24 software

**RESULTS AND DISCUSSION**

**Table 1: Age.**

Age in year	No	%
20-25	161	40.25
26-30	127	31.75
31-35	112	28
Total	400	100

The mean age of study population was 27.26 years with standard deviation (SD) ± 4.21 .The mean maternal age in the study group of of Carvalho MB et al was 26.2 years<sup>[4]</sup> and that in a study by Leung T N et al was 29.6 years.<sup>[5]</sup>

**Table 2: Gestational age at delivery in relation to age.**

Age	<37 weeks (Preterm)	≥37 weeks (Term)	Total
20-25	24 (14.90%)	137 (85.09%)	161
26-30	24 (18.89%)	103 (81.10%)	127
31-35	36 (32.14%)	76 (67.85%)	112
	84 (21%)	316 (79%)	400 (100%)

$\chi^2 = 3.67$  p= 0.05

The rate of preterm labor in our study group of uncomplicated primigravidas was 21%.The highest incidence of preterm labor was observed in the age group of 31 – 35 years (42.86% of all spontaneous preterm births). A steady and significant increase in the rate of preterm birth was observed in relation with age.

The mean cervical length (CL) at 11 – 14 weeks in our study group was 3.88 cm (SD ± 0.304). the minimum was 2.8 cm & maximum CL was 4.9 cm. This was similar to the study by Leung TN et al (mean CL 3.79 cm )<sup>[5]</sup> CL measured at 20 weeks in the same group was 3.461cm(SD 0.374). This was similar to study by Hebbar S et al where the mean CL was 3.5 cm at 20 weeks<sup>[6]</sup> Wadhawan UT et al found a mean CL of 3.37 cm at 20-22 weeks<sup>[3]</sup>

**Table 3: Cervical length or 11-14 weeks & 20 weeks.**

Cervical length	11-14 weeks		20-22 weeks	
	N	%	N	%
2.5 – 3 cm	3	0.8	83	20.8
3.1 – 3.5 cm	66	16.5	145	36.3
3.6 – 4.0 cm	219	54.8	156	39.0
>4 cm	112	28	16	4.0
Total	400	100	400	100

**Table 4: CL at 11-14 weeks & Gestational outcome.**

Cervical length	Preterm	Term	Total
2.5 – 3.0 cm	1 (33.3%)	2 (66.6%)	3
3.1 – 3.5 cm	11 (16.66%)	55 (83.66%)	66
3.6 – 4.0 cm	49 (22.37%)	170 (77.62%)	219
>4.0 cm	23 (20.53%)	89 (79.46%)	112

$\chi^2 = 0.113$  p value = 0.733

The CL at 11 – 14 weeks was not significantly associated with preterm birth.

**Table 5: Cervical Length at 20 weeks and gestational outcome.**

CL in cm	Preterm	Term	Total
2.5 – 3.0 cm	33 (39.75%)	50 (60.24%)	83
3.1 – 3.5 cm	24 (16.55%)	121 (83.45%)	145
3.6 – 4.0 cm	27 (17.31%)	129 (82.69%)	156
>4.0 cm	0	16 (100%)	16

	84	316	400
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$\chi^2 = 14.31$  p value = 0.000

67.85% of patients who underwent sPTB had CL in the range of 2.5 – 3.5 cm. No patients with more than 4 cm CL at 20 weeks underwent sPTB. CL at 20 weeks was found to be significantly associated with sPTB. The cut

off value of CL at 20weeks significantly associated with SPTB in the study by Wadhawan UT et al was 2.75 cm.<sup>[3]</sup>

**Table 6: Reduction in CL between 11-14 weeks & 20 weeks and gestational outcome.**

Reduction in CL	Preterm	Term	Total
<1 cm	78 (19.89%)	314 (80.10%)	392 (98%)
>1 cm	6 (75%)	2 (25%)	8 (2%)
	84 (21%)	316 (79%)	400

$\chi^2 = 11.82$  p value = 0.001

98% of study population had a reduction in CL of < 1 cm from 11 – 14 weeks to 20 weeks .80.10% of this group reached term gestation. 2% had CL reduction > 1 cm of which 75 % had SPTB The reduction in CL and its association with SPTB was found to be statistically significant.

At the onset of labor, myometrial activation is characterised by increased level of expression of contraction associated proteins (CAP) including connexion 43 causing formation of gap junctions and increase in oxytocin receptors<sup>[7]</sup> In the cervix there is a normal decline in expression and activity of lysil hydroxylase and lysil oxidase. So also thrombospondin – 2 (THBS – 2) and tenacin (TNC) proteins are downregulated until just before birth. This leads to

appropriately assembled collagen for maintenance of pregnancy.

Cervical changes preceding the onset of labor are gradual and develop over several weeks Cervical ripening is characterised by rearrangement and realignment of collagen, elastin, smooth muscle cells and the content of glycosaminoglycans (GAG). Cervical total GAG content increases during progression of pregnancy .GAGs include hyaluronan (HA) and proteoglycans. Increased hyaluronan sulphate 2 expression and subsequent hyaluronic acid is a distinct feature of cervical ripening. Large molecular weight HA along with proteoglycan versican increases viscoelasticity, hydration, distensibility and disorganisation of collagen leading to cervical ripening.<sup>[8]</sup>

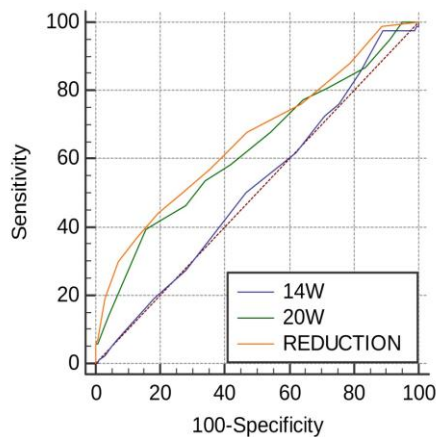
**Table 7: Reduction in cervical length and Gestational outcome in relation with CL at 20 weeks.**

CL at 20 weeks	Reduction term 11-14 weeks	Preterm	Term	Total
2.5-3.0 cm	<1	30 (37.97%)	49 (62.02%)	79 (19.75%)
	≥1	3 (75%)	1 (25%)	4 (1%)
3.1-3.5 cm	No reduction	0	11 (100%)	11 (2.75%)
	<1	21 (16.15%)	109 (83.85%)	130 (32.5%)
	≥1	3 (75%)	1 (25%)	4 (1%)
3.6-4.0 cm	No reduction	0	17 (100%)	17 (4.25%)
	<1	27 (19.42%)	112 (80.58%)	139 (34.75%)
>4.0 cm	No reduction	0	7 (100%)	7 (1.75%)
	<1	0	9 (100%)	9 (2.25%)
		84 (21%)	316 (79%)	400 (100%)

When there was no reduction in cervical length from 11 – 14 weeks and 20 weeks, out of 35 patients all had fullterm delivery irrespective of CL at 20 weeks. So also, when CL was > 4 cm at 20 weeks even when with a reduction of CL < 1 cm all patients had reached term gestation.

A total of 84 women (21%) underwent sPTB. The mean age at delivery was 35.2 weeks. In a study by Owen J et al the mean gestational age at delivery was 35.2 weeks which was similar to present study. The sPTB increases as the CL decreases with increasing gestational age.<sup>[9]</sup> CB Wulf et al conducted a prospective study of 3477 singleton low risk pregnancies by measuring CL during

first and second trimesters. 38.8 % of the study group had CL ≤ 2.5 cm. There was a 9 fold increase in SPTB in this group.<sup>[10]</sup> There was no patients with CL < 2.5 cm in our study. LA Moroz et al studied 2695 women for association of cervical length shortening and risk of preterm labor .For every 1mm cervical shortening , 3% increase in risk of preterm labor was observed .Change in CL was associated with sPTB in women with CL < 2.5 cm ( Odds ratio 0.97; 95% confidence interval 0.96 - 0.98 ).<sup>[11]</sup>



**Figure 1: Receiver operating characteristics curves of cervical lengths, reduction of the prediction of spontaneous preterm birth.**

**Table 8: Area Under Curve (AUC).**

Area under ROC curve	0.662
Standard error (SE)	0.0352
95% confidence interval (CI)	0.614-0.709
z statistic	4.612
Significance level p (Area = 0.5)	<0.0001

Receiver operating characteristic curve (ROC) analysis showed a cut off value of > 0.6 cm reduction in CL from 11 – 14 weeks and 20 weeks was a statistically significant predictor of sPTB. The sensitivity was found to be 44.05 % and specificity 80.07 %. In a similar study Wadhawan et al showed a CL difference cut off > 0.6 cm was significantly associated with sPTB.<sup>[3]</sup>

In our study where low risk singleton pregnant women were screened with CL, 84 (21%) underwent sPTB .53.6% of these patients delivered before 34 weeks .No intervention was done since no patients had CL < 2.5 cm. Son et al studied 17000 women by universal screening of CL at midtrimester with transvaginal USG and progesterone treatment was offered to women with CL ≤ 20 mm . Compared to 47000 unscreened singleton pregnancies there was a significant reduction of about 20 % in the rate of sPTB.<sup>[12]</sup> A P Souka et al did universal CL screening of 10506 singleton pregnant women at midtrimester and intervention with progesterone was done when CL was ≤ 15 mm . There was a reduction of sPTB of 20%<sup>[13]</sup> Campbell S analysed different studies on universal screening and progesterone treatment. Compared with the cost of sPTB, he found that universal screening and intervention is highly cost effective to the health care system.<sup>[14]</sup>

**CONCLUSION**

A reduction in cervical length from 11 – 14 weeks and 20 weeks was significantly associated with spontaneous preterm birth even in low risk women. Universal screening of cervical length along with routine antenatal USG in the first and midtrimester is recommended to

identify at risk patients so that appropriate interventions can prevent neonatal morbidity and mortality associated with spontaneous preterm birth.

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