

## ORIGINAL RESEARCH

# Assessment of comparison of the predictive value of transvaginal cervical length between 11 to 14 weeks and 20 to 22 weeks of gestation in preterm labour

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### ABSTRACT

**Background:** Preterm birth can cause immediate fetal complications like apnoea of prematurity, respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC), neonatal sepsis. The present study was conducted to assess comparison of the predictive value of transvaginal cervical length between 11 to 14 weeks and 20 to 22 weeks of gestation in preterm labour. **Materials & Methods:** The present study was conducted on 100 subjects in the postgraduate department of Obstetrics and Gynaecology and department of Radiodiagnosis and Imaging in SMGS Hospital, Government Medical College, Jammu. Cervical length was measured using transvaginal ultrasonography. **Results:** At 11 to 14 weeks gestation, the maximum number of participants (59%) had cervical length in the range of 3.6 cm to 4 cm with the minimum cervical length being 3 cm and maximum cervical length being 4.8 cm. 7 % of women who delivered preterm had cervical length ranges between 3.6 to 4 cm, whereas 52% of women had term delivery with same cervical length. 6% of women who delivered preterm had cervical length between 3.1 to 3.5 cm and 7% of women who delivered term also had cervical length between 3.1 to 3.5 cm. When we correlate the cervical length at 20-22 weeks in relation to preterm and term delivery, 9% of women who delivered preterm had cervical length ranges between 2.6 cm to 3 cm whereas only 2% of women delivered at term with same cervical length. **Conclusion:** Results from our study suggest that assessment of cervical length during the second trimester is useful in identifying women who are likely to have premature births and who may benefit from treatments such as vaginal progesterone and cervical cerclage.

**Key words:** cervical length, trimester, Preterm labour

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### INTRODUCTION

Preterm labour is defined as the onset of regular, painful, frequent uterine contractions causing progressive effacement and dilatation of cervix occurring before 37 completed weeks of gestation from the first day of last menstrual period. Preterm infants who are born with a low birth weight produce major social and economic public health problem in developing as well as developed nations.<sup>1</sup> Preterm labour is accountable for nearly 75% of all neonatal mortality and neurological morbidity. Similarly, early preterm delivery before 34 weeks of gestation has even a greater influence on perinatal morbidity and mortality.<sup>2</sup>

Preterm birth can cause immediate fetal complications like apnoea of prematurity, respiratory distress

syndrome (RDS), intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC), neonatal sepsis, jaundice and also long-term complications like cerebral palsy, retinopathy of prematurity, neurodevelopmental impairment and learning disabilities, etc., which in turn puts an additional economic burden on developing countries like ours.<sup>3</sup>

By identifying women with a high risk of preterm delivery we can make some attempt to reduce its incidence. Reducing morbidity and mortality associated with preterm birth is one of the biggest challenges in obstetrics. Improvement can only be achieved if obstetricians can reliably identify women at risk of preterm labour, allowing for timely intervention.<sup>4</sup> The ideal predictive test for preterm delivery should have sufficient sensitivity and

specificity to ensure identification of women who will benefit from treatments for preterm labour, while avoiding unnecessary, and potential harmful treatment of women who will not deliver early or for whom such treatment would be ineffective.<sup>5</sup> The present study was conducted to assess comparison of the predictive value of transvaginal cervical length between 11 to 14 weeks and 20 to 22 weeks of gestation in preterm labour.

## MATERIALS & METHODS

The present study was conducted on 100 subjects in the postgraduate department of Obstetrics and Gynaecology and department of Radiodiagnosis and Imaging in SMGS Hospital, Government Medical College, Jammu over a period of one year i.e from 1st November 2021 to 31st October 2022. The institutional review board approval for the study protocol was taken before commencement of the study. Pregnant women attending the OPD at SMGS Hospital at 11 to 14 weeks of gestation were enrolled in the study, after considering the inclusion and exclusion criteria. Written informed consent was taken from patient/attendant before inclusion in the study.

All included patients were subjected to detailed history taken on a predesigned and pretested proforma. Complete physical and obstetric examination was done. Cervical length was measured using transvaginal ultrasonography on Samsung Sono Ace R7 ultrasound machine using end firing 6.5 MHZ TVS probe, with the standard longitudinal view of cervix while the patient bladder was empty. Sterile gel is utilised as a coupling agent, and the transducer is inserted into a probe cover. The elevated lithotomy

position is applied to the patient. The internal os should seem flat or with a V-shaped notch on the TVU approach, the external os should have a dimple or triangle-shaped area of echodensity, and the cervical canal should appear echogenic with surrounding hypoechoic glandular tissue to variable degrees.

The most significant technical error with TVU is the endocervical canal lengthening brought on by the transducer's deformation of the cervix. The transducer is inserted just enough into the vagina to enable viewing of the whole length of the mother's cervix. It is then slightly pulled back, causing the image to lose focus, then repositioned until the cervix is barely visible. By using this method, the cervix is freed from any pressure that could artificially lengthen the measurement. Cervical length was measured from internal os to the external os, at least 3 measurements were taken and the shortest best measurement was recorded. The patient was then followed up and cervical length was again measured at 20 to 22 weeks using transvaginal ultrasonography. All included subjects were then followed up, to determine time and mode of delivery and also perinatal outcomes with regard to NICU admission and APGAR (Appearance, pulse, grimace, activity and respiration) score was recorded. The following analyses were done such as the mean cervical length at 11 to 14 weeks and at 20 to 22 weeks, the rate of shortening of cervical length in those who deliver at term and preterm, the cervical length at 11 to 14 weeks and at 20 to 22 weeks correlated with gestational age at delivery and its predictive value. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table I Age distribution among the study subjects**

Age group (years)	Number	Percentage
≤20	12	12
21-25	46	46
26-30	33	33
≥31	9	9
Total	100	100
Mean±SD	25.29±3.81	

A total of 100 participants were included in the study. The majority of subjects (46%) were belonging to the age group of 21-25 years, followed by 33% subjects in age group of 26-30 years, 12 subjects were ≤20 years of age and 9 subject were ≥31 years of age. Mean (±SD) age was 25.29±3.81.

**Table II Distribution of participants according to cervical length**

Cervical Length (in cm)	Pregnant Women with Cervical Length At 11-14 Weeks		Pregnant Women with Cervical Length At 20-22 Weeks	
	N	%	N	%
2.1-2.5	0	0	3	3
2.6-3	8	8	11	11
3.1-3.5	13	13	43	43
3.6-4	59	59	28	28
4.1-4.5	14	14	13	13
4.6-5	6	6	2	2

Total	100	100	100	100
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Table II shows that at 11 to 14 weeks gestation, the maximum number of participants (59%) had cervical length in the range of 3.6 cm to 4 cm with the minimum cervical length being 3 cm and maximum cervical length being 4.8 cm. The mean cervical length of pregnant women at 11 to 14 weeks was 3.83

cm. At 20 to 22 weeks, the maximum number of participants (43%) had cervical length in the range of 3.1 to 3.5 cm with the minimum cervical length being 2.1 cm and maximum cervical length being 4.4 cm. The mean cervical length of pregnant women at 20 to 22 weeks was 3.36 cm.

**Table III Correlation of cervical length at 11 to 14 weeks and 20 to 22 weeks in relation to term and preterm delivery**

Cervical length (in cm) At 11-14 weeks	Term	Preterm	Total
2.1-2.5	0	0	0
2.6-3	2	6	8
3.1-3.5	7	6	13
3.6-4	52	7	59
4.1-4.5	13	1	14
4.6-5	6	0	6
Cervical length (in cm) At 20-22 weeks			
2.1-2.5	0	3	3
2.6-3	2	9	11
3.1-3.5	36	7	43
3.6-4	27	1	28
4.1-4.5	13	0	13
4.6-5	2	0	2

Table III shows that when we correlate the cervical length at 11 to 14 weeks in relation to preterm and term delivery, 7 % of women who delivered preterm had cervical length ranges between 3.6 to 4 cm, whereas 52% of women had term delivery with same cervical length. 6% of women who delivered preterm had cervical length between 3.1 to 3.5 cm and 7% of

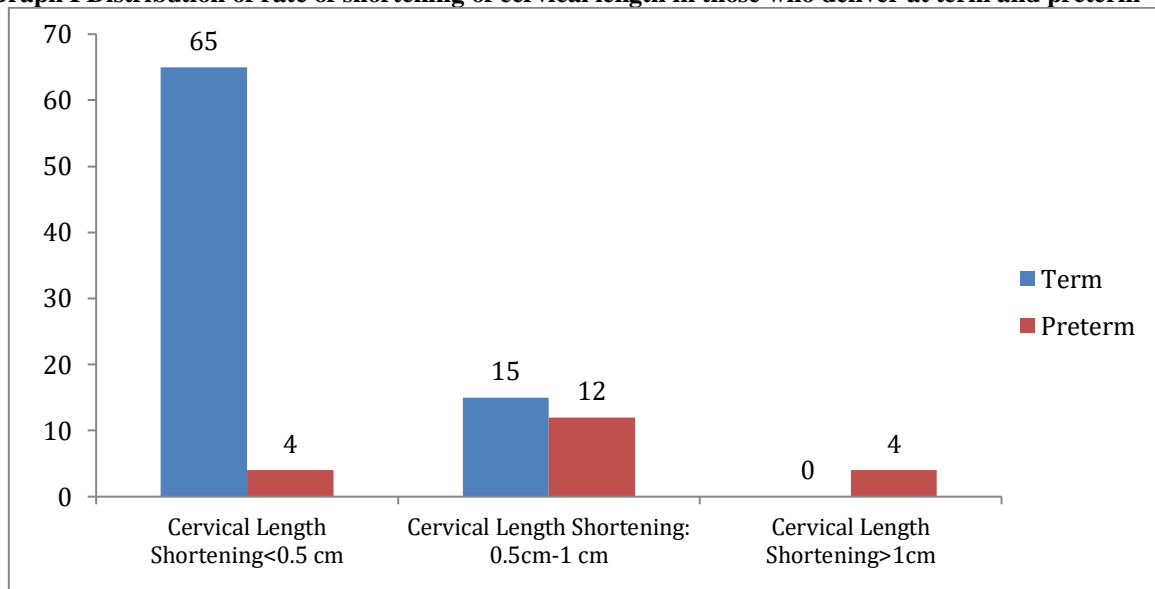
women who delivered term also had cervical length between 3.1 to 3.5 cm. When we correlate the cervical length at 20-22 weeks in relation to preterm and term delivery, 9% of women who delivered preterm had cervical length ranges between 2.6 cm to 3 cm whereas only 2% of women delivered at term with same cervical length.

**Table IV Distribution of study subjects in relation to reduction in cervical length**

Cervical Length Reduction	N	%
Cervical length <0.5 cm	69	69
Cervical length 0.5cm-1 cm	27	27
Cervical length >1cm	4	4
Total	100	100

Table IV shows that out of total 100 women, majority of women (69%) had cervical length reduction of <0.5 cm, on the other hand 27% of women had cervical length reduction between 0.5-1cm and only 4% of women had cervical length reduction of >1cm.

**Graph I Distribution of rate of shortening of cervical length in those who deliver at term and preterm**



Graph I shows that when the reduction in cervical length was less than 0.5 cm majority of participants (65%) continued their pregnancy upto term, whereas only 4% of participants delivered preterm. When reduction in cervical length between 0.5 cm to 1 cm, 12% of participants delivered preterm and 15% of participants had term delivery, whereas only 4% of

women had cervical length reduction of more than 1 cm and all had preterm delivery. There was a statistically significant difference present in women who delivered at term when compared with women who had preterm delivery, when compared in relation to cervical length reduction ( $p < 0.01$ ).

**Table V Birth weight of neonates in relation to reduction in cervical length**

Cervical Length Reduction	Birth Weight		P value
	<2.5 kg	≥2.5 kg	
Cervical length <0.5 cm	1	68	<0.01
Cervical length 0.5cm-1 cm	10	17	
Cervical length >1cm	4	0	

Table V shows that among 69% of women who had cervical length reduction <0.5 cm, 68% of neonates had birth weight ≥2.5 kg and only 1% of neonates had birth weight <2.5 kg. Among 27% of women with cervical length reduction between 0.5-1cm, 17% of neonates had birth weight ≥2.5 kg and 10% of

neonates had birth weight <2.5 kg. And all 4% of women who had reduction of > 1 cm had birth weight <2.5 kg. There was a statistically significant difference present in neonates with birth weight <2.5 kg and ≥2.5 kg when compared in relation to reduction in cervical length ( $p < 0.01$ ).

**Table VI NICU admission of neonates in relation to reduction in cervical length**

Cervical Length Reduction	NICU admission		P value
	Yes	No	
Cervical length <0.5 cm	1	68	<0.01
Cervical length 0.5cm-1 cm	16	11	
Cervical length >1cm	4	0	

Table VI shows that among 69% of women who had cervical length reduction <0.5 cm, 68% of neonates did not required NICU admission and only 1% of neonates required NICU admission, whereas Among 27% of women with cervical length reduction between 0.5-1cm, 11% of neonates did not required NICU admission and 16% of neonates required NICU

admission. And all 4% of neonates who had cervical length reduction > 1 cm required NICU admission. There was a statistically significant difference present in neonates who had NICU admission and those who do not have NICU admission when compared in relation to reduction in cervical length ( $p < 0.01$ ).

**Table VII Diagnostic efficacy of cervical length at 11-14 and 20-22 weeks**

Cervical Length	Cut-off value	Sensitivity	Specificity	PPV	NPV	p value
11-14 Weeks	3.7cm	72.5%	56.72%	63.91%	91.8%	<0.01
20-22 Weeks	2.92cm	79.20%	100%	82.4%	99.6%	<0.01

Reduction in cervical length	>0.73cm	74.5%	81.20%	52.3%	92.6%	<0.01
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In our study cut-off of cervical length at 11-14 weeks of gestation was taken as 3.7cm and was statistically significant for prediction of preterm labour with the sensitivity of 72.5%, the specificity of 56.72%, Positive Predictive Value (PPV) of 63.91% and Negative Predictive Value (NPV) of 91.8%. Whereas at 20 to 22 weeks of gestation cervical length cut-off for predicting preterm labour was taken as 2.92 cm, the value is statistically significant with the sensitivity of 79.2%, the specificity of 100%, PPV of 82.4% and NPV of 99.6%. Reduction in cervical length from 11 to 14 weeks to 20 to 22 weeks of gestation more than 0.73 cm is predictive of preterm labour with a sensitivity of 74.5%, the specificity of 81.20%, PPV of 52.3% and NPV of 92.6% with statistical significance (p value <0.01).

## DISCUSSION

Shortening and funneling of the cervix was first described to be associated with the diagnosis of incompetence. To predict the cervical changes culminating in preterm labour has remained a tough nut to crack. In such situations, ultrasonographic assessment of cervical length may provide an effective non-invasive method of help.<sup>6</sup>

The various methods to evaluate cervical length are transvaginal, transabdominal and transperineal ultrasound.<sup>7</sup> Each of these techniques has its own benefits and limitations. Various studies have shown that the transvaginal method is the most reliable. Transvaginal ultrasound is objective, reproducible, and acceptable to patients.<sup>8</sup>

We found that at 11 to 14 weeks gestation, the maximum number of participants (59%) had cervical length in the range of 3.6 cm to 4 cm with the minimum cervical length being 3 cm and maximum cervical length being 4.8 cm.

We found that 7% of women who delivered preterm had cervical length ranges between 3.6 to 4 cm, whereas 52% of women had term delivery with same cervical length. 6% of women who delivered preterm had cervical length between 3.1 to 3.5 cm and 7% of women who delivered term also had cervical length between 3.1 to 3.5 cm. When we correlate the cervical length at 20-22 weeks in relation to preterm and term delivery, 9% of women who delivered preterm had cervical length ranges between 2.6 cm to 3 cm whereas only 2% of women delivered at term with same cervical length. Mangalampeta SR<sup>9</sup> conducted a study including 264 primigravida, singleton pregnancy, and measure cervical length at 11 to 14 weeks and at 20 to 22 weeks of gestation. The mean cervical length at 11-14 and 20-22 weeks, the rate of cervical shortening in term and preterm deliveries, and the cervical length at 11-14 and 20-22 weeks were linked with gestational age at delivery and their predictive value were studied. Cut-off of cervical length at 11-14 and 20-22 weeks of gestation was 3.73

cm and 2.89 and was statistically significant for the prediction of preterm labour.

We found that when the reduction in cervical length was less than 0.5cm majority of participants (65%) continued their pregnancy upto term, whereas only 4% of participants delivered preterm. We found that among 69% of women who had cervical length reduction <0.5 cm, 68% of neonates had birth weight  $\geq 2.5$  kg and only 1% of neonates had birth weight <2.5 kg. Among 27% of women with cervical length reduction between 0.5-1cm, 17% of neonates had birth weight  $\geq 2.5$  kg and 10% of neonates had birth weight <2.5 kg and all 4% of women who had reduction of > 1 cm had birth weight <2.5 kg. There was a statistically significant difference present in neonates with birth weight <2.5 kg and  $\geq 2.5$  kg when compared in relation to reduction in cervical length (p<0.01).

We found that among 69% of women who had cervical length reduction <0.5 cm, 68% of neonates did not required NICU admission and only 1% of neonates required NICU admission, whereas Among 27% of women with cervical length reduction between 0.5-1 cm, 11% of neonates did not required NICU admission and 16% of neonates required NICU admission. In our study cut-off of cervical length at 11-14 weeks of gestation was taken as 3.7 cm and was statistically significant for prediction of preterm labour with the sensitivity of 72.5%, the specificity of 56.72%, positive predictive value (PPV) of 63.91% and negative predictive value (NPV) of 91.8%. Thain S et al<sup>10</sup> evaluated relationship between spontaneous preterm birth and cervical length in 1013 women with singleton pregnancies at less than 14 weeks of gestation and measured transvaginal cervical length at each of 4 antenatal visit (Visit 1: < 14 weeks, Visit 2: 18-22 weeks, Visit 3: 28-32 weeks and Visit 4: > 34 weeks). The result shows that there was a significantly shorter cervical length both in the 2nd trimester (18 to 22 weeks) and the 3rd trimester (28 to 32 weeks) in the preterm birth group compared to the term birth group.

The limitation the study is small sample size.

## CONCLUSION

We found that the cervical length measured at 11 to 14 weeks and at 20 to 22 weeks gestation was decreased in women with singleton pregnancies, who are at risk for preterm delivery and was useful for identifying these patients, and when we compare the predictive value of Transvaginal cervical length at 11 to 14 weeks and 20 to 22 weeks of gestation in preterm labour, cervical length at 20 to 22 weeks is more predictive than at 11 to 14 weeks of gestation. Results from our study suggest that assessment of cervical length during the second trimester is useful in identifying women who are likely to have premature

births and who may benefit from treatments such as vaginal progesterone and cervical cerclage.

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