Research Article

Comparison of the Predictive Value of Transvaginal Cervical Length at 11-14 Weeks and at 20-22 Weeks of Gestation in Preterm Labour

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ABSTRACT

Background: Preterm labour is defined as the onset of labour before 37 weeks of gestation, in pregnancy beyond 20 weeks of gestation, and is responsible for nearly 75% of all neonatal mortality and neurological morbidity. Cervical length (CL) is one of the major determinants of preterm delivery. Several studies have been able to conclude that transvaginal CL assessment may be a useful tool for the prediction of preterm delivery. The risk of preterm birth varies inversely with CL measured by ultrasound in low-risk women.

Objective: To evaluate and compare the predictive value of transvaginal cervical length between 11-14 weeks and 20-22 weeks of gestation in preterm labour.

Material and Methods: A total of 264 pregnant women who were primigravida, singleton pregnancy, and women at gestational age 11-14 weeks and 20-22 weeks were included in the study. They were subjected for CL measurement at 11-14 and 20-22 weeks of gestation using transvaginal ultrasonography with the standard longitudinal view of the cervix while the patient's bladder was empty. GEL VOLUSON 730 PRO Trans Vaginal Ultrasound (TVS) probe IC 5-9 H instrument with 5-9 MHz was used to measure CL.

Results: The variables analyzed were the mean cervical length at 11-14 weeks and 20-22 weeks, the rate of shortening of cervical length in those who deliver at term and preterm and the cervical length at 11-14 weeks 20-22 weeks was correlated with gestational age at delivery and the predictive value of the same was determined. 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 pre-term labour. Reduction in cervical length from 11-14 weeks to 20-22 weeks of gestation of more than 0.7 cm is predictive of preterm labour with statistical significance (p<0.001).

Conclusion: Routine mid-pregnancy cervical length assessment in low-risk women can be a cost-effective method of preterm birth reduction but the implementation of such a policy is highly dependent upon local factors. If it is to be undertaken, cervical length assessment should be performed according to a standardized technique.

Keywords: Preterm labour; Cervical length; Transvaginal ultrasonography

Abbreviation: CL: Cervical Length; TVS: Trans Vaginal Ultrasound

INTRODUCTION

Preterm labour is defined as the onset of labour before 37 weeks of gestation, in pregnancy beyond 20 weeks of gestation [1]. It is responsible for nearly 75% of all neonatal mortality and neurological morbidity [2]. Similarly, early preterm delivery before 34 weeks of gestation has even a greater impact on perinatal morbidity and mortality. By identifying women with a high risk of preterm delivery an attempt can be made to reduce the same.

Cervical Length (CL) is one of the major determinants of preterm delivery. It is controversial whether routine ultrasound assessment of the cervix can be a means of defining the risk of

preterm delivery in low-risk women [3,4]. But previous studies have shown that therapeutic interventions like cervical cerclage and progesterone in women with ultrasonographically determined short cervix reduce the preterm birth incidence among them [5-7].

Several studies have been able to conclude that transvaginal CL assessment may be a useful tool for the prediction of preterm delivery. The risk of preterm birth varies inversely with CL measured by ultrasound in low-risk women [3,4,8]. Some have demonstrated that the measurement of CL in the first trimester was useful [9], whereas others did not find it as a reliable predictor of preterm delivery [10,11]. Many studies have found that mid-trimester CL measurement is a reliable predictor of preterm delivery [12,13]. Hence there is a need to evaluate and compare the predictive value of transvaginal cervical length between 11-14 weeks and 20-22 weeks of gestation in preterm labour.

MATERIAL AND METHODS

With a level IV evidence, a prospective observational study was performed from July 2017 to June 2019 in the department of Obstetrics and Gynaecology, JJM Medical College, Davangere, Karnataka, India. A total of 264 pregnant women (considering 5% prevalence, 95% confidence interval, and 3% precision a sample size is calculated as 264 pregnant women) who satisfied the inclusion and exclusion criteria of the study were enrolled in or study.

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The variables analyzed were the mean cervical length at 11-14 weeks and 20-22 weeks, the rate of shortening of cervical length in those who deliver at term and preterm, and the cervical length at 11-14 weeks 20-22 weeks were correlated with gestational age at delivery and the predictive value of the same was determined.

The mean cervical length was calculated at 11-14 weeks and 20-22 weeks scan. The student's t-test was used to determine the differences in the cervical lengths at the first and second scans for the group of patients who delivered either at term or preterm. Logistic regression analysis was used to determine the independent contribution of shortening of the cervix, the cervical length at the 11-14 week and 20-22 week scans, and the

demographic characteristics in predicting preterm delivery in women at low and high risk.

Figure 1: TVS measurement of cervical length at 14 weeks.

Figure 2: TVS measurement of cervical length at 21 weeks.

RESULTS

A total of 264 participants were included in our study. The maximum number of participants (55.68%) was in the age group of 21-25 years. The ages among the subjects ranged from a minimum age of 19 years to a maximum age of 34 years. The mean (± SD) age was 24.75 ± 5.18 years (Table 1).

Table 1: Age distribution among participants.

Age (years)	No of pregnant women (%)
≤20	39 (14.77)
21-25	147 (55.68)
26-30	61 (23.10)
31-35	17 (6.43)
Total	264 (100)

The mean cervical length of pregnant women at 11-14 weeks of gestation was 3.73 ± 0.91 cm. At 11-14 weeks gestation, the maximum number of participants (49.62%) had cervical length

in the range of 3.6 cm-4.0 cm with the minimum length being 2.1 cm and maximum being 4.7 cm.

The median cervical length was 3.7 cm. At 20-22 weeks gestation, most subjects (45.07%) had cervical length in the range of 3.1 cm-3.5 cm with the same minimal and maximal values. The mean cervical length was 3.42 ± 0.39 cm and the median being 3.2 cm (Table 2).

Table 2: Distribution of participants according to gestational age at delivery.

Cervical length (cm)	No of pregnant women with cervical length at 11-14 weeks (%)	No of pregnant women with cervical length at 20-22 weeks (%)
2.1-2.5	9 (3.40)	7 (2.65)
2.6-3.0	26 (9.84)	26 (9.84)
3.1-3.5	37 (14.01)	119 (45.07)
3.6-4.0	131 (49.62)	71 (26.89)
4.1-4.5	44 (16.66)	32 (12.12)
4.6-5.0	17 (6.4)	9 (3.40)
Total	264 (100)	264 (100)

Out of the total 264 women, 22 (8.33%) delivered preterm and 242 (91.66%) delivered full term.

All women (264) included in the present study were divided into 3 groups according to the reduction in cervical length measured with TVS at 11-14 weeks (Figure 1) and 20-22 (Figure 2) weeks as follows:

Group A: Cervical length<0.5 cm, Group B: Cervical length 0.5 cm-1 cm, and Group C: Cervical length >1cm.

The majority of the participants (179 in number; 67.8%) had a cervical length reduction between 0.5 cm and 1 cm.

On the other hand, a total of 74 participants (28.03%) had a cervical length reduction of less than 0.5 cm and a minority (11 in number; 4.1%) had a reduction of more than 1 cm.

When the reduction in cervical length was less than 0.5 cm, most of the patients continued pregnancy up to term (69 in number; 93.24%), whereas only 3 participants (4.05%) and 2 participants (2.7%) delivered preterm with gestation age being >34 weeks and ≤ 34 weeks.

With cervical length reduction between 0.5 cm and 1cm, the majority of subjects (173) delivered term (96.6%) as compared to 4 subjects (2.23%) and 2 subjects (1.11%) who delivered preterm at gestational age >34 weeks and ≤ 34 weeks.

As the reduction in cervical length increases more women delivered preterm.

With the reduction in cervical length more than 1 cm, 99.99% delivered preterm (Table 3).

Table 3: Birth weight.

Birth weight (kg)	Group A (n=74)	Group B (n=179)	Group C (n=11)
<2.5	2 (2.70%)	7 (3.91%)	10 (90.90%)
≥ 2.5	72 (97.29%)	172 (96.08%)	1 (9.09%)

The incidence of low birth weight was 2.7%, 3.91%, and 90.9% in groups A, B, and C respectively. In group A, the majority (93.24%) delivered at term and no baby required NICU admission (Table 4).

Table 4: Diagnostic indices.

Tests	Cut-off value	Sensitivity	Specificity	PPV	NPV	p-value
Cervical length at 11-14 weeks	3.73 cm	69.01%	57.82%	23.19%	90.43%	<0.001
Cervical length at 20-22 weeks	2.89 cm	75%	100%	100%	98.16%	<0.001
Reduction in cervical length	>0.7 cm	62.15%	82.25%	49.10%	92.45%	<0.001

Cut-off of cervical length at 11-14 weeks of gestation was 3.73 cm and was statistically significant for prediction of pre-term labour with the sensitivity of 69.01%, the specificity of 57.82%, Positive Predictive Value (PPV) of 23.19% and Negative Predictive Value (NPV) of 90.43%. Whereas at the gestation of 20-22 weeks, cervical length cut-off for predicting preterm labour was 2.89, the value is statistically significant with the sensitivity of 75%, the specificity of 100%, PPV of 100% and NPV of 98.16%. Reduction in cervical length from 11-14 weeks to 20-22 weeks of gestation of more than 0.7 cm is predictive of preterm labour with asensitivity of 62.15%, the specificity of 82.25%, PPV of 49.1% and NPV of 92.45% with statistical significance (p<0.001).

DISCUSSION

Our study was undertaken to assess cervical length by transvaginal ultrasonography during routine NT scan at 11-14weeks and anomaly scan between 20-22 weeks of gestation in 264 booked pregnant women. The maximum number of participants (55.68%) were in the age group of 21-25 years. The mean (± SD) age of the participants was 24.75 ± 5.18 years. This was consistent with other studies done by M.H.B. Carvalho et

al. [14] and Wadhawan UT et al. [15] (median maternal age was 26.2 years).

As per recommendations by Society for Maternal-Fetal Medicine, strict guidelines should be followed for universal CL screening. It has been demonstrated that there is progressive shortening of the cervix from first to the second trimester and the shortening is more rapid in women who deliver prematurely or those who have a history of preterm delivery [3,4,8,14] Mean cervical length of pregnant women at 11-14 weeks and 20-22 weeks of gestation was 3.73 ± 0.91 cm and 3.42 ± 0.39 cm respectively. Maximum women had cervical length in the range of 3.6 cm-4.0 cm and 3.1 cm-3.5 cm in the above-mentioned periods of gestations respectively. As a reduction in cervical length increased more women delivered preterm. With a reduction in CL <0.5 cm and between 0.5 cm-1cm, 6.75% and 3.34% respectively delivered preterm which increased to 99.99% when the reduction in CL became more than 1 cm. This was similar to studies done by M.H.B. Carvalho et al. [14], Wadhawan UT et al. [15] and Ismail Ozdemir et al. [16] showed that the mean cervical length at 11-14 weeks and 22-24 weeks were 42.4 mm; 38.3 mm and 40.5 mm; 37.1 mm respectively.

For the prediction of pre-term labour, a cut-off of CL at 11-14 weeks of gestation was 3.73 cm with asensitivity of 69.01%, specificity of 57.82%, and statistical significance. Whereas at 20-22 weeks, CL cut-off was 2.89, the value is statistically significant with the sensitivity of 75% and specificity of 100%. Reduction in cervical length from 11-14 weeks to 20-22 weeks of gestation of more than 0.7 cm was found to be predictive of preterm labour with asensitivity of 62.15%, the specificity of 82.25%, PPV of 49.1% and NPV of 92.45% (p<0.001). This demonstrated that cervical length measurement used to predict preterm delivery was found to be more predictive at 20-22 weeks than at 11-14 weeks.

This is in accordance with the findings of previous various studies of Wadhawan UT et al. [15] done on this subject. M.H.B. Carvalho et al. [14] showed that CL was not significantly different in those delivered at term (42.7 mm) and preterm (40.6) at 10-14 weeks. But at 22-24 weeks it was significantly different (preterm-26.7 mm and term-39.3 mm) (p=0.0001). Ismail ozdemir et al. [16] concluded similarly (preterm CL-28.4 mm and term CL-37.8 mm). Furthermore, Kagan KO et al. [12] and Hebbar S et al. [13] emphasized on the role of mid-trimester transvaginal cervical ultrasound in the prediction of preterm delivery.

Performed at 14 weeks' gestation, Meir YJ et al. [10] concluded that TVS measurement of the cervical canal length to predict spontaneous preterm delivery is not a reliable screening procedure. On the other hand, Elena Greco et al. [9] demonstrated that measurement of endo-cervical length at 11-13 weeks could predict labour more efficiently. The median cervical length was shorter (27.5 mm vs 32.5 mm p<0.001) between those who delivered preterm and term but there was no difference in the length of the cervico-isthmic complex (41.4 mm vs 45.4 mm p=0.054).

CONCLUSION

Mid-pregnancy cervical length assessment is of value in identifying women at increased risk of preterm birth who may benefit from interventions such as vaginal progesterone or cervical cerclage. This may be used to further stratify risk in women with other identified preterm birth risk factors. Routine mid-pregnancy cervical length assessment in low-risk women can be a cost-effective method of preterm birth reduction but the implementation of such a policy is highly dependent upon local factors. If it is to be undertaken, cervical length assessment should be performed according to a standardized technique.

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