Original Research Article

Role of Cervical Length in Predicting the Premature Labour: A Prospective Observational Study

Dr. Farooq Ahmad Dar[1], Dr. Iqra Riyaz[2], Dr. Qurat Ul Ain[3]

[1,2,3]Department of Obstetrics and Gynecology, GMC Srinagar

Corresponding Author: Dr. Iqra Riyaz

ABSTRACT

Background: Over the last decade, little progress has been made in understanding and preventing preterm birth, and the incidence of spontaneous preterm birth has continued to rise, even in low risk women. One of the key predictors of premature birth is cervical length.

Methods: This was a hospital based prospective study conducted at the postgraduate department of obstetrics and gynecology, Government Lalla Ded Hospital, Srinagar for a period of one and a half year (2019-2021). Out of the 140 women, 36 were removed from the research owing to rescue or emergency cerclage, and 22 women were lost to follow-up. For the 82 remaining women, the association between cervical length between the 16th and 24th week of pregnancy and premature birth was examined.

Results: We observed that 2.5 cm cervical length was the ideal cut-off with sensitivity, specificity, positive predictive, negative predictive, and accuracy values of (68.7%), (75.7%), (77.5%), (66.7%), and (71.9%), respectively. The average cervical length of patients with gestational age at delivery fewer than 37 weeks was significantly smaller compared to those with gestational age more than 37 weeks at delivery (2.75 vs 3.92, p-value < 0.001).

Conclusion: We concluded that a short cervical length of <2.5cm is a risk factor for development of spontaneous preterm labour and that ≤ 2.5mm is an optimum threshold for it. Our findings imply that the cervix's length is a reliable predictor of its competence and should be seen as a continuous rather than a binary characteristic. Preterm birth is more likely to occur if the cervix is shorter than normal. The length of the cervix strongly correlates with the length of pregnancy.

Keywords: Cervical length, Preterm, Pregnancy

INTRODUCTION

According to the World Health Organization, preterm birth (PTB) is any birth that occurs before 37 weeks of gestation.[1] Preterm births can be caused by four different factors directly: (A) spontaneous unexplained preterm labour with intact membranes (45%); (B) idiopathic preterm premature rupture of membranes (PPROM); (C) delivery for maternal or foetal indications; (16%-17%); and (D) twins and higher order multi-fetal births (3%-4%).[2] In most countries, its prevalence ranges from 5 to 8%. In developing nations like Asia (11.4%), it complicates 9-11% of all pregnancies.[3,4] This prevalence is rising in many nations, including wealthy nations, despite increased research efforts.[2] Increases in the frequency of multiple pregnancies, assisted reproductive technologies, improved gestational age tracking and recording, more foetal monitoring, iatrogenic births, etc., are some of the causes that may be attributed to it. In recent years, ultrasound examination of the cervix has grown in importance as a component of obstetric diagnostic imaging, particularly with the advent of transvaginal probes and the growing acceptability of transvaginal sonography in pregnant women. As it provides for greater quality and more precise vision of the uterine

cervix, transvaginal sonographic measuring of the cervix is a reliable alternative approach for determining cervical length.[5] Nearly 75% of infant deaths and neurological disabilities are caused by preterm birth.[6] Preterm labour is characterised as labour beginning prior to 37 weeks of gestation.[7] However, there is a higher effect on perinatal morbidity and death when delivery occurs before to 34 weeks of gestation. One of the key predictors of premature birth is cervical length. With cervical length, which is determined by a transvaginal/ transabdominal scan at 20-22 weeks, the risk of premature delivery changes inversely.[8] As a result, the ultrasound evaluation of cervical length has become a crucial part of obstetric scanning. Transvaginal cervical length evaluation may be a helpful method for predicting preterm birth, according to a number of studies. While some have shown the value of measuring cervical length between 11 and 14 weeks, others have found it to be an unreliable indicator of premature birth.[9-12] The majority of women, even those at the highest risk, have a normal cervical length in the first trimester, which is an interesting observation. This is probable because even the weakest cervix will not be likely to open up due to the strain the expanding gestational sac places on it.[13] For this reason, cervical length screening before week 14 of pregnancy is not particularly effective.[13,14] Therefore, it is necessary to assess the transvaginal cervical length between 20-22 weeks of gestation in preterm labour for its prognostic significance.

MATERIAL AND METHODS

The study was conducted in the postgraduate department of obstetrics and gynecology, Government Lalla Ded Hospital, 750 bedded tertiary care hospital of the valley, an associated hospital of GMC Srinagar. This was a hospital based prospective study for a period of one and a half year (2019-2021). Ethical clearance was obtained from the institutional ethical committee of the medical college. After explaining the procedure and techniques of the study, written informed consent was taken from participants for participation in the study. Following patients were included in the study:

➢ Second trimester gestation age (16-24weeks)
➢ 22-35 years age group
➢ Patients with no significant medical or surgical history
➢ Low obstetric risk, that is, absence of pregnancy complications and uterine anomalies.

However, patients with preterm premature rupture of membranes at the time of examinations, patients with cervical funneling with very short cervical length on TVS who underwent rescue cerclage, patients with a history of preterm labour, genital tract infections, multiple pregnancies, congenital malformation of the foetus or intrauterine death, pregnancies following assisted reproductive technology, and high-risk patients, that is, those with known pregnancy complications, were are all excluded from the study.

In accordance with WHO recommendations, preterm birth was defined as a spontaneous delivery occurring before 37 weeks of gestation.[1] By using the patient's last menstrual cycle date and a first trimester ultrasound, gestational age was calculated. The reported date of the last menstrual cycle, if it was known with confidence, or the length of the fetus's crown-rump measured at the first ultrasound scan, were used to estimate the length of the pregnancy on the day the cervical length by transvaginal sonography was assessed. Experienced hospital radiologists conducted all measures. To avoid erroneous cervical elongation, each examination was carried out while the patient was in the lithotomy position and had an empty bladder. A vaginal probe was aimed at the anterior fornix in all individuals until an appropriate sagittal segment of the uterine cervix was found. On the assumption that the

thicknesses of the front and posterior cervical lips were identical, the total length of the cervical canal was calculated by identifying the mucosa. The sagittal plane was used to assess cervical diameters. The internal and external cervical os were located in the sagittal plane, and the distance along the cervical canal between them was calculated as the cervical length. Out of the 140 women, 36 were removed from the research owing to rescue or emergency cerclage, and 22 women were lost to follow-up. For the 82 remaining women, the association between cervical length between the 16th and 24th week of pregnancy and premature birth was examined. Preterm births, very preterm births, and extremely preterm births were all defined as happening before 37 weeks of amenorrhea, 34 weeks, and 30 weeks, respectively.

STATISTICAL ANALYSIS
The gathered information was put into a Microsoft Excel spreadsheet, which was then exported to the data editor of SPSS Version 20.0. (SPSS Inc, Chicago, Illinois, USA). Continuous variables were presented as Mean SD, whereas percentages and frequencies were used to characterise categorical variables. Bar and pie graphs were used to visually display the data. For the purpose of comparing categorical variables, the chi-square test was used. Receiver operating characteristic (ROC) analysis was used to find the best cervical length cutoff for predicting premature labour. Cervical length diagnostic accuracy was also improved (Sensitivity, Specificity, PPV, and NPV). Statistical significance was defined as a P-value 0.05.

RESULTS
In the present study, we observed that mean age of study patients was 29.3±2.52 years, with majority of patients accounting for (52.4%) were belonging to the age group of 28-31 years. Around (41.5%) of patients had second gravidity, followed by 37.8% with primigravida status and 20.7% patients were multigravida.

Table 1: Gestational age at measurement of cervical length among study patients		
Gestational age (Weeks)	Number	Percentage
16-18 Weeks	25	30.5
19-21 Weeks	33	40.2
22-24 Weeks	24	29.3
Total	82	100
Mean±SD=20.1±2.23		

We evaluated the gestational age of patients at the time of measuring the cervical length and found the mean gestational age of patients was 20.1±2.23 weeks with majority of patients (40.2%) had their gestational age (19-21) weeks.

Table 2: Distribution as per cervical length among study patients		
Cervical length (cm)	Number	Percentage
≤ 2.5 cm	22	26.8
> 2.5 cm	60	73.2
Total	82	100

We measured the cervical length of patients and found that (26.8%) patients had a cervical length of ≤2.5 cm while as (73.2%) had a cervical length of >2.5 cm at the time of examination.

Table 3: Gestational age at delivery among study patients		
Gestational age (Weeks)	Number	Percentage
< 37 Weeks	37	45.1
≥ 37 Weeks	45	54.9
Total	82	100
Mean±SD=36.2±4.73		

We evaluated the gestational age at delivery among study population and found that the mean gestational age at delivery was 36.2±4.73 weeks, with (45.1%) women delivered at <37 weeks of gestation and 54.9% delivered at term.

Table 4: ROC analysis depicting diagnostic accuracy of cervical length in predicting preterm labour

Parameter	Value	95% CI
Optimal cutoff	≤ 2.5	-
Sensitivity	68.7	54.3-80.5
Specificity	75.7	59.5-86.6
PPV	77.5	62.5-87.7
NPV	66.7	51.6-78.9
Accuracy	71.9	61.4-80.5
Area under ROC Curve	0.793	0.689-0.875
P-value	<0.001	-
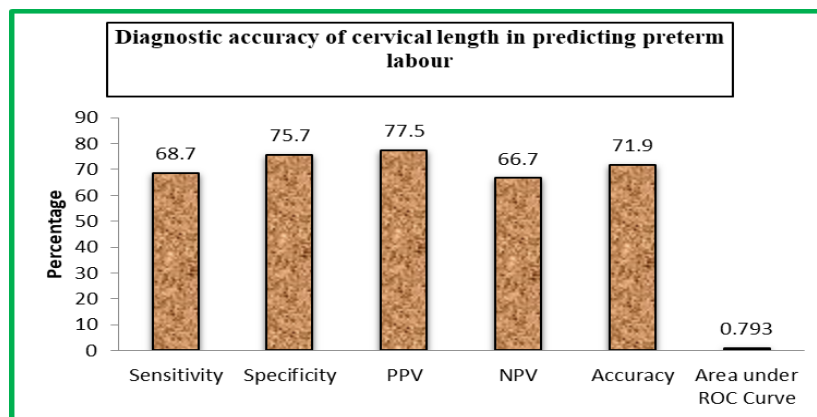
We used ROC curve analysis to show the diagnostic accuracy of cervical length in predicting preterm labour and found that 2.5 cm cervical length was the ideal cut-off with sensitivity, specificity, positive predictive, negative predictive, and accuracy values of (68.7%), (75.7%), (77.5%), (66.7%), and (71.9%), respectively. With ROC area of 0.79, the p-value was statistically significant (p<0.001).

Table 5: Comparison of cervical length (cm) as per gestational age

Gestational age (Weeks)	N	Mean	SD	t-value	P-value
< 37 Weeks	45	2.75	0.992	4.734	<0.001*
≥ 37 Weeks	37	3.92	1.2564.734 <0.001*		

Among the study subjects, we found that cervical length was significantly associated with gestational age at delivery, with 72.7% patients having short cervical length delivered at <37 weeks while as only 35% of those with normal cervical lengths delivered at <37 weeks. Evidently the average cervical length of patients with gestational age at delivery fewer than 37 weeks was significantly smaller compared to those with gestational age more than 37 weeks at delivery (2.75 vs 3.92, p-value <0.001)

DISCUSSION

In our study, the main outcome variable was gestational age at delivery, and the main predictor variable was second trimester cervical length determined by transvaginal sonography. Information on delivery, such as birth weight, APGAR ratings, manner of delivery, nursery admissions, and problems, was gathered from our hospital's records. A total of 82 patients in all were enrolled in the study after rigorously meeting the inclusion requirements and providing official consent for participation. In our study, we found that the mean age of

studied patients was 29.3±2.52 years, with 52% of patients were in the age range of 28–31 years, followed by 25% of patients in the age range of 24-27 years, and only 23.2% of patients were falling in the age group of 32–35 years. This was comparable to Judith et al study on cervical length at 16 to 22 weeks and the risk of preterm birth, which revealed that the mean age of participants was 26.4 ± 6.4 years years.[15] When determining the patients' gravidity, we found that 20.7% of patients were multigravidas, 37.8% of patients were primigravidas, and 41.5% of patients were second gravidas. In agreement with our study, Judith et al. reported 50.6% primigravidas, 28.1% second gravidas, and 21.3% multigrvidas.[15] While a research on a related problem by Nooshin Eshraghi et al only included primigravidas.[16] In the present study, we evaluated the transvaginal cervical length between 20–22 weeks of gestation in preterm labour for its prognostic significance. The majority of clinical recommendations for preterm birth and cervical length advise cervical length screening between 16 and 24 weeks of gestation.[17,18] Most of the studies do not advocate taking cervical length measurements prior to 16 weeks of pregnancy due to the limited predictive accuracy of first and early second trimester cervical length assessments for preterm delivery, particularly in asymptomatic women without a history of preterm birth.[19,20] Furthermore, it is not advised for asymptomatic women to have routine cervical length screening after 24 weeks of pregnancy because studies describing different preventative measures for preterm delivery typically utilise this time frame as the upper bound for the start of treatments or interventions.[21] Our study's mean gestational age at the time of cervical length measurement was 20.1±2.23 years, which is consistent with some prior studies.[21,22] Transvaginal sonography measures of cervical lengths were performed on the majority (40.2%) of patients between 19 and 21 weeks, followed by measurements on

30.5% of patients between 16 and 18 weeks, and only 29.3% of patients between 22 and 24 weeks. The mean gestational age at delivery was 36.2± 4.73 weeks, with 45.1% of patients giving birth before 37 weeks and 54.9% after 37 weeks. This was consistent with the findings of Cook et al. and Cristopher et al, who in related investigations reported that the mean age at delivery was 36.4± 3.7 weeks and 36 weeks, respectively.[23,24] It is not clear yet whether the difference in cervical length between populations is due to environmental factors that would interfere in population growth capability, such as nutrition and access to health services, or due to intrinsic characteristics such as ethnicity/race and anthropometric features. In our study, we found that out of 82 individuals, 22 (26.8%) had cervical lengths under 2.5 cm and 60 (73.2%) had cervical lengths beyond 2.5 cm. This was similar to the study of Vinistine et al., where 23% of patients had cervical lengths of less than 25 mm and 77% had cervical lengths of more than 25 mm. Cook et al, on the other hand, found that 40.03% of patients had short cervical length and 59.16% had normal cervical length.[23] In our study, we analyzed that amongst patients who had a short cervical length (<2.5 cm), a total of 73.2%(16/22) delivered at <37 weeks of gestation) and only 27.3%(6/22) delivered at >37 weeks of gestation Among patients with cervical length of >2.5, cm only 35%(21/60) delivered at <37 weeks of gestation while majority, that is 65% (39/60) patients delivered at >37 weeks of gestation. This difference was statistically significant (t value = 4.734, p<0.01) implying that the incidence of preterm delivery was much higher in those with short cervical lengths of ≤2.5cm than in those with cervical lengths of >2.5 cm. According to a prospective study by Wang Y et al in a Chinese population, preterm birth rates were observed to be 75% in the group of patients with short cervical as opposed to just 7% in the group of patients with normal cervical lengths.[25] Similar to this, Cook et al and

Andrew et al observed premature delivery rates of 49% and 50%, respectively, in women with short cervical lengths, as opposed to only 25% and 17% preterm birth rates, respectively, in women with cervical lengths of >25 mm.[23,26] The ideal cutoff value for cervical length measurement in predicting preterm labour was established in our study using a receiver operating characteristic (ROC) curve, and a cut-off of 2.5 cm was found. This was consistent with a number of studies that have been done on the topic and found an ideal cut-off at cervical length of 25mm for the prediction of preterm labor.[9,24,27] According to research by Guzman et al, a cervical length of less than 2.5 cm was better for predicting prematurity and was on par with other cervical measures for predicting spontaneous preterm delivery.[28] The cut-off was determined to have a sensitivity of 68.7%, specificity of 75.7%, positive predictive value (PPV) of 77.5%, negative predictive value (NPV) of 66.7%, and accuracy of 71.9%, according to our assessment. The sensitivity, specificity, positive predictive value, and negative predictive value for reported by Cook et al were 67%, 66%, 33%, and 89%, respectively.[23] Using a cut-off of 30mm at 24-28 weeks of gestation, Davies et al. reported a sensitivity of 57% and a specificity of 82% for preterm delivery which is consistent with our study. This shows that measuring the cervical length helps diagnose people who are at risk for preterm delivery as well as identify those who are at low risk.

CONCLUSION

We concluded that a short cervical length of <2.5cm is a risk factor for development of spontaneous preterm labour and that ≤2.5mm is an optimum threshold for it. Our findings imply that the cervix's length is a reliable predictor of its competence and should be seen as a continuous rather than a binary characteristic. Preterm birth is more likely to occur if the cervix is shorter than normal. The length of the cervix strongly correlates with the length of pregnancy.

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