Original Research Article

A study of cervical length measured ultrasonographically in prediction of preterm delivery

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Abstract

Introduction- Cervical length appears to be an efficient test for predicting preterm birth. Transvaginal sonography (TVS) is the preferred route for cervical assessment to identify women at increased risk of spontaneous preterm birth and may be offered to women at increased risk of preterm birth. **Methods-** This was prospective observational study conducted in Obstetrics and Gynecology department of SMS Medical college, Jaipur, Rajasthan, Indiafrom August 2015 to July 2016. Out of obstetric cases attending antenatal OPD, cases of singleton pregnancies were selected at random. In this study all the participants were divided into 2 groups: Each group include 100 patients. Every participant underwent a transvaginal sonography (TVS), using probe of 5 to 7.5 MHz, measuring cervical length. **Results-** About 39 women in control group and 36 women in study group were primigravida, remaining were multigravida. History of preterm labour was present in 27 women in study group and 28 women in control group. Cervical length measurement was 21-26 mm in 30 (30%) women and among them 12 (44.44%) delivered preterm. Mean birth weight was 1.75±0.04 in control group and 1.75±0.06 in study group in which cervical length was between 21-26 mm. In our study in study group revealed Prevalence – 27%, Positive predictive value – 52.10%, Negative predictive value – 88.70%, Sensitivity – 81.48%, Specificity – 75.34%. **Conclusion-** We found that TVS had good sensitivity, specificity, predictive value in both group. Thus measurement of cervical length by TVS can be used to predict increase risk of preterm delivery cases with threatened preterm labor.

Keywords – Cervical length, Multigravida, Preterm delivery, Transvaginal ultrasonography.

Introduction

Preterm delivery is the leading cause of neonatal mortality and morbidity [1]. Although many predictors for preterm delivery have been proposed, complete prediction and prevention have not yet been established [2]. Cervical length appears to be an efficient test for predicting preterm birth; it has been found to be the best single predictor of preterm birth <34 weeks in asymptomatic women, with the risk of preterm delivery increasing dramatically for lengths <15 mm [3,4]. Transvaginal sonography (TVS) is the preferred route for cervical assessment to identify women at increased risk of spontaneous preterm birth and may be offered to women at increased risk of preterm birth. Also, it can be used to assess the risk of preterm birth in women with a history of spontaneous preterm birth and to differentiate those at higher and lower risk of preterm delivery [5]. Cervical length is an independent predictor of preterm delivery in women with preterm labor [6].

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Aims and Objective

1. To compare length of cervical canal in patient with normal pregnancy and patient with high risk for preterm labor.

2. To study the relation of cervical length with preterm delivery and baby outcome.

Material and Methods

Study design- This was prospective observational study conducted in Obstetrics and Gynecology department of SMS Medical college at Mahila Chikitsalya, Sanganeri Gate, Jaipur, Rajasthan, Indiafrom August 2015 to July 2016. Out of obstetric cases attending antenatal OPD, cases of singleton pregnancies were selected at random after thorough history taking and meticulous clinical examination. Prior to commencement of first examination, informed consent was taken and patient was explained about the study. This study was approved by research ethical committee.

Inclusion Criteria

- Women with gestational age ≥30 to ≤32wk.
- Singleton gestation.
- Women with intact amniotic membrane.
- Women with complain of threatened preterm labor, defined as occurrence of uterine contraction have no effacement or dilatation of cervix by digital examination.

Exclusion Criteria

- Pregnant women with other complicating factor which are indicationfor induced preterm delivery such as
  (a) Preeclamsia
  (b) Pregnancy with severe IUGR
  (c) Pregnancy with RH isoimmunization
- Cervical incompetence
- Multiple gestation
- Low lying placenta
- History of first trimester bleeding
- Presence of uterine malformation and leiomyoma.

In this study all the participants were divided into 2 groups : Each group included 100 patients. Both of the group were statistically matched for age,socioeconomic status and duration of pregnancy.

Control Group: This group include

1. ≥30-≤32 week of singleton pregnancy
2. No risk factors for preterm labor

Study Group: This is target group, include

1. Patient with gestation age ≥30-≤32 week of pregnancy
2. Patient with risk for preterm labor i.e. patient with threatened preterm labor.

Study methods- Every participant underwent a transvaginal sonography (TVS), using probe of 5 to 7.5 MHz, measuring cervical length. Every scan was done by same person to reduce the interobserver variability and improve reproducibility of cervical measurements. Scan was performed in patient in semi supine position, buttock slightly elevated. Before proceeding to transvaginal ultrasound patients were asked to empty the bladder. With the patient in lithotomy position vaginal probe was introduced into vagina and the length was measured with the probe placed in anterior fornix of vagina. The appropriate sagittal view of cervix was obtained by simultaneous imaging of external and internal os. External os was identified by its triangular echo density and internal os by its V-shape appearance.

The cervical canal was seen as a translucent line connecting these two points. The distance between the external and internal os was taken as cervical length. Three measurements were obtained and shortest technically the best measurement in the absence of uterine contraction was recorded. Every patient was managed according to risk factor and followed throughout gestation. The ultimate outcome of pregnancy was noted in term of delivery before 37 weeks or after it.

Statistical analysis- All the data were compiled. Mean cervical length was calculated in two groups. In cases of categorical variables counts and percentages were recorded. 'p' value < 0.05 was considered as significant. Statistical analysis was performed with unpaired't' test and by Chi-Square test. Computer software SPSS 22.0for windows was used for analysis.

Results

Study was conducted on 200 pregnant women. Among them 100 were those who came with threatened preterm labor and 100 were asymptomatic. About 6% of pregnant women in both study and control group were under the age of 20 years, 80% of control group and 81% of study group were in age group of 20-25 years, 12% of control group and 11% of study group were in age group of 26-30 years and 2% study and control group were over the age of 30 years.

Maximum number of women (50%) in control group and 52% in study group were illiterate followed by those who have received primary level of education, 22% in control group and 24% in study group. The patients who received college education were 10% in control group and 8% in study group and none of the patients had received professional level of education. About 39 women in control group and 36 women in study group were primigravida, remaining were multigravida. About 4 (10.26%) out of 39 women in primigravida and 14 (22.95%) out of 61 women in multigravida had cervical length ≤ 26 mm in control group. About 11 (30.56%) out of 36 women in primigravida and 27 (42.19%) out of 64 women in multigravida had cervical length ≤ 26 mm in study group. In control group 18% and in study group 38% women had cervical length ≤ 26 mm that is significant. History of preterm labour was present in 27 women in study group and 28 women in control group. About 20 (74.07%) out of 27 had cervical length ≤ 26 mm in study group and 7 (25%) women in control group had cervical length ≤ 26 mm as it is known that preterm labour is more common in patient with history of preterm labour. In our study this factor was statistically matched to avoid any bias.

Table-1: Distribution according to cervical length and term or preterm delivery in study and control group.

Cervical length (mm)	Study Group			Control Group		
	Preterm n(%)	Term n(%)	Total n(%)	Preterm n(%)	Term n(%)	Total n(%)
15-20 mm	8(29.63)	0(0.00)	8(8.00)	3(23.08)	0(0.00)	3(3.00)
21-26 mm	12(44.44)	18(24.66)	30(30.00)	8(61.54)	7(8.05)	15(15.00)
27-32 mm	6(22.22)	23(31.51)	29(29.00)	1(7.69)	10(11.49)	11(11.00)
33-38 mm	1(3.70)	23(21.51)	24(24.00)	1(7.69)	31(35.63)	32(32.00)
39-44 mm	0(0.00)	9(12.33)	9(9.00)	0(0.00)	39(44.83)	39(39.00)
Total	**27 (27.00)**	**73 (73.00)**	**100 (100.00)**	**13 (100.00)**	**87 (100.00)**	**100 (100.00)**

Table- 2: Mean ± S.D. of cervical length of study and control group women who delivered preterm baby

Cervical length	Mean ± SD	
	Study group	Control
15-20 mm	17.50±1.00(n=8)	17.33±1.88(n=3)
21-26 mm	24.17±0.99(n=12)	25.00±1.00(n=8)
27 mm & above	29.00±2.27(n=1)	32.00±2.00(n=2)

Table-3: Predictive value, sensitivity and specificity for preterm delivery of transvaginal ultrasonography measurement of cervical length in study group and control group.

Cervical length (mm)	Study Group			Control Group		
	Delivery		Total	Delivery		Total
	Preterm	Term		Preterm	Term	
≤26 mm	20	18	38	11	7	18
≥26 mm	7	55	62	2	80	82
Total	**27**	**73**	**100**	**13**	**87**	**100**

In study group 8 (29.63%) had cervical length 15-20 mm and all patient delivered preterm. Cervical length measurement was 21-26 mm in 30 (30%) women and among them 12 (44.44%) delivered preterm. Cervical length measurement was 27-32 mm in 29 (29%) women and among them 6 (22.22%) delivered preterm. Remaining 33 patients had cervical length 33mm and above. None of the women in 39 mm or above delivered preterm. In control group 15-20 mm cervical length was in 3 patients and none of them reached to term. Women who delivered preterm delivery 8 (61.54%) had cervical length between 21-26 mm. The remaining 82 women had cervical length 27 mm or above and out of them only 2 delivered preterm. None of the women among 39 mm or above cervical length measurement delivered preterm. **(Table-1)**

To determine the most useful cutoff point for cervical length, we referred the study done by Rosenberg P et al 1997 [7]. This showed that a cutoff point of 26 mm best minimized both the false positive and false negative results.

In study group 38.00% women had cervical length ≤ 26 mm and out of them 20 (74.07%) delivered preterm while cervical length >26 mm found in 62.00% women, among them 55 (75.34%) delivered at term only 7 delivered preterm. This was because there may be many etiological factors of preterm labour which may not be identified. In control group 13.00% delivered preterm and among preterm delivered women 11 had cervical length ≤ 26 mm. 82 women had cervical length >26 mm and only 2(15.38%) out of them delivered preterm

Mean cervical length with standard deviation was 17.33±1.88 mm in 3 patients who had cervical length between 15-20 mm in control group while in study group it was 17.50±1.00 mm of 8 patients. Mean cervical length with standard deviation was 25.00±1.00 mm in 8 patients who had cervical length between 21-26 mm in control group while in study group it was 24.17±0.99 mm of 12 patients. Mean cervical length with standard deviation was 32.00±2.00 mm in 2 patients who had cervical length≥27 mm in control group while in study group it was 29.00±2.27 mm of 1patient. **(Table-2)**

In study group 38 women had cervical length ≤ 26 mm remaining 62 had ≥26 mm. 20 out of 38 and 7 out of 62 women delivered preterm so in study group 27 women delivered preterm. Risk of preterm delivery was 52.10% with abnormal result and 11.28% with normal result. In control group 18 women had cervical length ≤ 26 mm remaining 82 had ≥26 mm. 11 out of 18 and 2 out of 82 women delivered preterm so in control group 13 women delivered preterm. Risk of preterm delivery was 61.12% with abnormal result and 2.43% with normal result.

In control group 17 babies were low birth weight (Weight <2.5 kg), 11(64.70%) babies were from these women whose cervical length was <26mm and in study group 31 babies were LBW. 23(74.19%) out of them were from those women whose cervical length was ≤ 26 mm. Mean birth weight of preterm babies was 1.72±0.18kg in control group and 1.71±0.13kg in study group. There was no significant difference between 2 group for birth weight of preterm and term baby as mean birth weight of term babies was 2.69±0.22 in control group and 2.60±0.23 in case group.(p value > 0.05)

Mean birth weight was 1.47±0.14 in control group and 1.54±0.07 in study group in which cervical length was between 15-20 mm. Mean birth weight was 1.75±0.04 in control group and 1.75±0.06 in study group in which cervical length was between 21-26 mm. Mean birth weight was 1.97±0.03 in control group and 1.84±0.08 in study group in which cervical length was ≥27 mm. (p value > 0.05)

In our Study Group, Prevalence – 27%, Positive predictive value – 52.10%, Negative predictive value – 88.70%, Sensitivity – 81.48%, Specificity – 75.34% and in control group Prevalence – 13%, Positive predictive value – 62.12%, Negative predictive value – 97.56%, Sensitivity–91.53%, Specificity – 91.95% wereobserved.**(Table- 3)**

Discussion

In our study 80% of control group and 81% of study group were in age group of 20-25 years, 12% of control group and 11% of study group were in age group of 26-30 years. Statistically mean age of participants were 21.98 years and standard deviation 3.0739. In a similar study doneby Kore SJetal 2009 majority of the women were in age group of 20-30 years and mean age of the subjects studied was 23 years [8]. A study done by Qudah S et al 2017 in Jordan on 100 patients also showed similar results [9]. An Indian study done on 91 pregnant patients by Khushboo et al 2017 had 86.8% patients in this age group [10]. Relatively young women participated in the study as age was statistically matched factor, age distribution was not significantly different between both group.

About 39 women in control group and 36 women in study group were primigravida, remaining were multigravida. In an Indian study done by Begum J et al 2014 studied 51 cases, out of them 22 (43.20%) were primigravida and 29 cases (56.80%) were multigravida [11]. A study done by QudahS et al 2017 in Jordan on 100 women including 38.75% were primi and 61.25% were multiparous [9].

History of preterm labor was present in 27 women in study group and 28 women in control group. About 20 (74.07%) out of 27 had cervical length ≤ 26 mm in study group and 7 (25%) women in control group had cervical length ≤ 26 mm as it is known that preterm labour is more common in patient with history of preterm labor. In our study this factor was statistically matched to avoid any bias. A study done by Qudah S et al 2017 in Jordanon 100 women had incidence of preterm delivery 90% with cervical length <30 mm. Mean cervical length with standard deviation was 17.33±1.88 mm in 3 patients who had cervical length between 15-20 mm in control group while in study group it was 17.50±1.00 mm of 8 patients. Mean cervical length with standard deviation was 25.00±1.00 mm in 8 patients who had cervical length between 21-26 mm in control group while in study group it was 24.17±0.99 mm of 12 patients. Mean cervical length with standard deviation was 32.00±2.00 mm in 2 patients who had cervical length ≥27 mm in control group while in study group it was 29.00±2.27 mm of 1 patient.A study done by Qudah S et al 2017 in Jordanon 100 women had mean cervical length 21±5 mm with cervical length <30 mm[9]. In an Indian study done by khushboo et al 2017 had mean cervical length at 30 weeks 28.1±3.9 mm. Iams JD et al[12], Mukherji J et al[13], Berghella V et al 1997 [14]. A study done on 100 patients by Wadhawan UT et al 2017 had mean cervical length 33.7 mm [15]. The large cervical length in the studies compared to present study could be due to different racial profile and exclusion of subjects at higher base line risk of preterm delivery.

In study group 38 women had cervical length ≤ 26 mm remaining 62 had ≥26 mm. 20 out of 38 and 7 out of 62 women delivered preterm so in study group 27 women delivered preterm. Risk of preterm delivery was 52.10% with abnormal result and 11.28% with normal result. In control group 18 women had cervical length ≤ 26 mm remaining 82 had ≥26 mm. 11 out of 18 and 2 out of 82 women delivered preterm so in control group 13 women

delivered preterm. Risk of preterm delivery was 61.12% with abnormal result and 2.43% with normal result. A study done by Qudah S et al 2017 in Jordanon 100 women had incidence of preterm delivery 90% with cervical length < 30 mm. Rosenberg et al 1997 showed risk of preterm labour with abnormal results was 50% and with normal test results was 10.9% (7). A study done by Crane JM et al 1997 showed that risk of preterm was greater in patients who showed shortening of upper cervical segment < 10 mm [16].

In control group 17 babies were low birth weight (Weight <2.5 kg), 11 (64.70%) babies were from these women whose cervical length was <26 mm and in study group 31 babies were LBW. 23 (74.19%) out of them were from those women whose cervical length was ≤ 26 mm. Mean birth weight of preterm babies was 1.72±0.18kg in control group and 1.71±0.13kg in study group. There was no significant difference between 2 group for birth weight of preterm and term baby as mean birth weight of term babies was 2.69±0.22 in control group and 2.60±0.23 in case group. In an Indian study done on 100 patients by WadhawanUT et al 2017 had mean birthweight 2.7 kg [15].

In our study in study group revealed Prevalence – 27%, Positive predictive value – 52.10%, Negative predictive value – 88.70%, Sensitivity – 81.48%, Specificity – 75.34%. Similar studies conducted by Begum J et al 2014 andIams JD et al1996 showed similar results (11, 12).

Tsoi E et al 2003 studied 216 patients showed similar results as our study (1). These results showed that TVS had excellent negative predictive value so its use in high risk for preterm labour cases is justified and in asymptomatic cases it also had a good result.

Conclusion

The study therefore concludes that the risk of preterm delivery is high in women with cervical length ≤ 26 mm and strict management is required for those cervical length is less than 20 mm to improve the neonatal outcome. We found that TVS had good sensivity, specificity, predictive value in both group. Thus measurement of cervical length by TVS can be used to predict increase risk of preterm delivery cases with threatened preterm labor.

A positive correlation was observed between cervical length and birth weight of preterm baby. Preventive measures can be carried out and this may allow reduction in number of unnecessary potentially dangerous tocolytic treatment and hospitalization. Its use in asymptomatic women need large clinical trial.

Abbreviations

TVS- Transvaginal Sonography, **IUGR-** Intrauterine growth retardation, **PPV-** Positive predictive value, **NPV-** Negative predictive value, **LBW-** Low birth weight.

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