Original Article

Predictive value of transvaginal sonographic cervical length at 18-24 weeks gestation in preterm labour in primigravida

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Abstract

Introduction: Preterm labour is the leading cause of neonatal morbidity and mortality and is responsible for nearly 75% of neonatal death and neurological handicap.Cervical length is one of the major determinants of preterm delivery. There is an inverse relationship between length of cervix measured by ultrasonography and frequency of spontaneous preterm birth. **Aims and Objectives:** To evaluate cervical length assessment by TVS at 18 -24 weeks of gestation for predicting women at risk of preterm delivery. To study the requirement of interventions and its outcome. To study perinatal outcome in terms of term/preterm, Apgar score and admission to NICU. **Material and Methods:** A prospective study over a period of 2 years was carried on 100 primigravida singleton pregnancies of 18-24 weeks of gestation booked for regular ante natal check up at Krishna Institute of Medical Sciences, Karad, and were subjected to Transvaginal ultrasound measurement of cervical length and were followed till delivery. **Results:** In this study, 87% delivered term, whereas preterm birth was seen in 13%. In patients with cervical length ≤ 2.5 cm, preterm delivery occurred in 66.67%, whereas 33.33% delivered term. Effectiveness of cerclage was not statistically significant but it contributed in decreasing the incidence of preterm labour. **Conclusion:** Transvaginal ultrasonography of the cervix during routine anomaly scan is safe, acceptable and a cost-effective test to assess risk of preterm delivery.

Keywords: Encerclage, Gestational age, Internal os, Birth weight, Apgar score.

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INTRODUCTION

Preterm labour is defined as the onset of labour before 37 completed weeks of gestation. It complicates 5-10% of pregnancies and is a leading cause of neonatal morbidity and mortality worldwide. Preterm delivery is responsible for nearly 75% of all neonatal death and neurological handicap. Delivery before 34 weeks of gestation has a greater impact on the perinatal morbidity and mortality. Early prediction, prevention and effective management of preterm labour will improve neonatal outcome and will have a profound impact on society and long-term public healthcare costs. Cervical length is one of the major determinants of preterm delivery. Sonographic assessment of cervix is widely accepted and well standardized method, which requires short period of training. There is an inverse relationship between length of cervix measured by ultrasonography and frequency of spontaneous preterm birth.[1] Ultrasound assessment of cervix is therefore an important part of obstetric diagnostic imaging. Transvaginal sonographic measurement of the cervix is a reliable alternative method for the assessment of cervical length. It allows better quality and more accurate visualization of the uterine cervix.[2] Changes associated with cervical ripening during labour can be detected by digital examination of the cervix but shows large variation among examiners. In

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contrast, transvaginal ultrasonography is a reproducible method of examination during pregnancy. It allows the recognition of changes in endocervical canal length and in the diameter and shape of the internal cervical os before they are apparent to the fingers of the examiner.

MATERIAL AND METHODS

A Prospective Study was done on 100 patients over a period of 2 years. The source of data was all primigravida with singleton pregnancy of 18-24 weeks of gestation booked for regular ante natal check up at Krishna Institute of Medical Sciences, Karad were included in this study and were followed up till delivery. The inclusion criteria was all primigravida singleton pregnancies who have the correct dating (reliable LMP in the background of regular menstrual cycles or ultrasound dating done in the first trimester), between 18-24 weeks of gestation. Patients not willing to give their consent for their involvement in the study or for transvaginal ultrasound measurement of cervical length were excluded from my study. Also, those with history of major medical or surgical illness (diabetes, HTN, TB, asthma, previous history of cervical biopsy, conization etc.) and those who developed medical or surgical complications in the later period and got terminated iatrogenically and those who missed follow up were excluded from the study. A detail history i.e. obstetric history, menstrual history, past history, family history and personal history was noted. General physical examination with routine obstetric examination was done. The investigations entailed Routine blood investigations such as hemoglobin estimation, CBC,BLOOD GROUPING AND RH TYPING, HIV, HBSAg, VDRL, GCT, Urine sugar, albumin and microscopy. Cervical length was measured by transvaginal ultrasonography using transvaginal probe EC 9-4 ENDOCAVITY PROBE on SIEMENS, ACUSON X300 ULTRASOUND IMAGING SYSTEM. 100 women included in present study were divided in 2 groups. Group A comprised women with Cervical length > 2.5 cm and Group B comprised women with Cervical length ≤ 2.5 cm. Group B was further divided in 2 groups. Group B1 with Cervical length 2.1 – 2.5 cm and Group B2 with Cervical length ≤ 2.0 cm.

RESULT

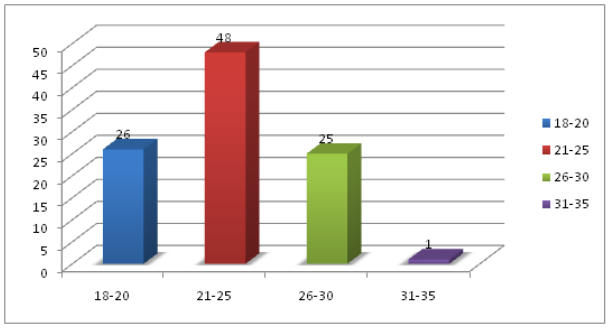


Figure 1

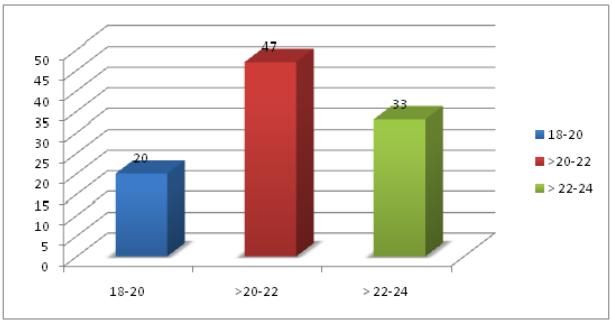
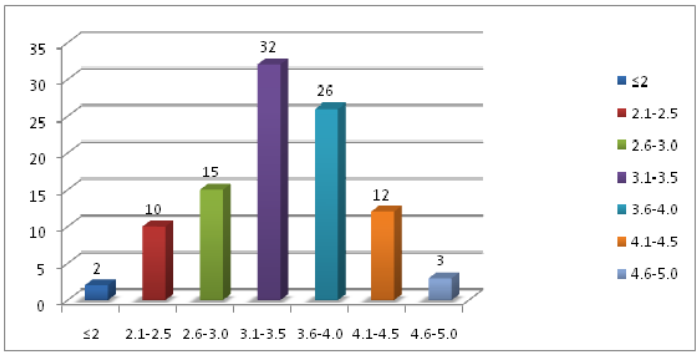


Figure 2



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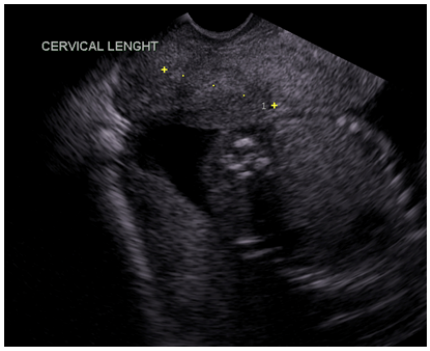

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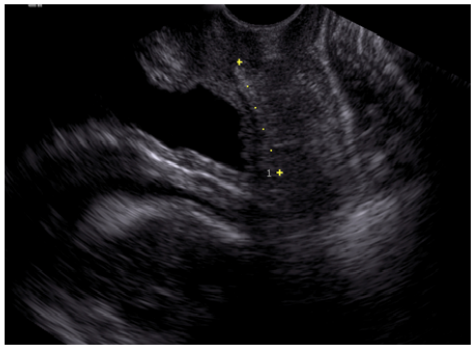

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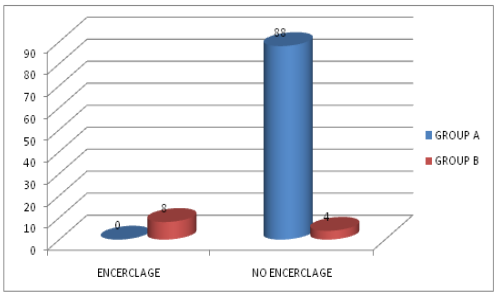

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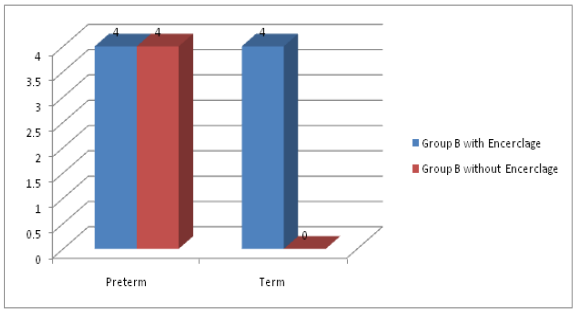

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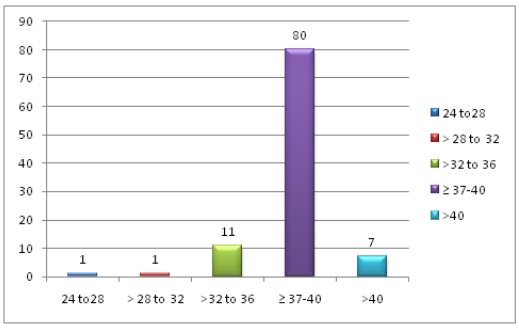

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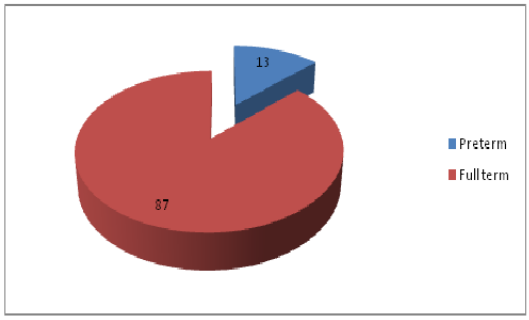

Figure 9

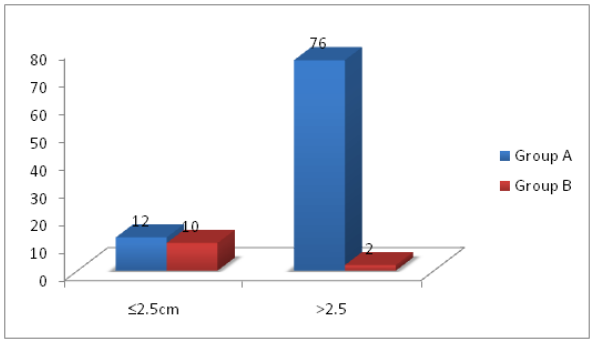

Figure 10

Legend

Figure 1: Age distribution of study group; **Figure 2:** Gestational age in weeks at the time of scan; **Figure 3:** Distribution of cervical length; **Figure 4:** Cervical length ~ 2.2cm at 21 weeks of gestation; **Figure 5:** Cervical length ~ 3.0 cm at 22 weeks of gestation; **Figure 6:** Patients with encerclage or no encerclage; **Figure 7:** Outcome of encerclage; **Figure 8:** Period of gestation in weeks at the time of delivery; **Figure 9:** Distribution of preterm and full term deliveries; **Figure 10:** Incidence of low birth weight

Table 1: Distribution of preterm and term deliveries

Gestational age at delivery	Group A (n=88)		Group B1 (n=10)		Group B2 (n=2)	
Early preterm deliveries (< 34 weeks)	1	1.1 %	2	20 %	1	50 %
Late preterm deliveries (>34 weeks)	4	4.5 %	4	40 %	1	50 %
Term Gestation	83	94.4%	4	40 %	0	0

Table 2: Birth weight distribution

BIRTH WEIGHT (kg)	Group A	Group B	Total Percentage (%)
≤1.5	-	1	1
>1.5 to 2.5	12	9	21
> 2.5 to 3.5	73	2	75
> 3.5 to 4.5	3	-	3
Total	**88**	**12**	**100**

In group A the incidence was 13.6%; while in group B it was 83.3% out of which 1(10%) in group B was extremely low birth weight <1.5kg.

DISCUSSION

Several studies have reported that cervical assessment may provide a useful tool for the prediction of preterm delivery. Recently ultrasonographic evaluation of the cervix offers a non-invasive and objective method to establish the diagnosis during pregnancy. In addition cervical changes on sonography may be the earliest indicators for prediction of preterm delivery. Cervical length measured by endovaginal ultrasound to predict preterm birth was first noted by Andersen *et al*[3]. On this background, current study was undertaken to assess cervical length by transvaginal ultrasonography during routine anomaly scan between 18-24 weeks of gestation in 100 booked pregnant women attending the outpatient department of Krishna institute of medical sciences, Karad meeting the inclusion criteria and were followed up till delivery for pregnancy outcome such as time, and mode of delivery, birth wt etc. Following inferences were found in my study. In this study majority of subjects belonged to the age group of 21-25 years, i.e. 48%. In a similar study done by Kore SJ[4]majority of women were in the age group of 20-30 years. Mean age of the subjects studied was 23 years(Fig1/Table 1). The mean age of similar study done by Leslie A. Moroz *et al* [5] was 23 years as well. The median maternal age for the women involved in a similar study by M.H.B. Carvalho *et al*[2] was 26.2 years. Minimum age in the study group was 18 years and maximum age was 32 years. The second largest group, i.e. 26% of the women belonged to the age group of 18-20 years. It was also observed that the highest incidence of preterm delivery was in age group 20-25 years i.e. 53.8%, followed by same incidence in age group of 18-20 years and 26-30 years i.e. 23.1% respectively. Relation of age on preterm delivery was significant. In this study maximum pregnant women got their scans done between 20-22 weeks of gestation (Fig2/Table2). Mean gestational age at the time of scan was 22 weeks. As recommended the cervical length scan should be performed between 22-24 weeks as part of the anomaly scan[6]. In this study cervical length in majority of the patients was between 3.1cm to 3.5cm (Fig3, 4 and 5/Table3, 4 and 5). Mean cervical length in the population studied was 3.4 cm. In this study minimum cervical length measured was 1.9cm and maximum cervical length measured was 5.0cm. In a similar study by P. Arora*et al*[7]mean cervical length was 3.2 cm with minimum measurement of 2.1 cm and maximum measurement of 4.4 cm. In similar studies by Jay D. Iams[8]andHebbar.S *et al*[1] the mean cervical length was 3.5 cm. All the patients with cervical length ≤ 2.5cm were advised encerclage (McDonalds stitch) and decision was left uptopatient's discretion (Fig6/Table 6). Out of 12 patients with cervical length ≤ 2.5cm, 8 patients underwent encerclage and 4 refused to undergo the procedure and were managed expectantly. All patients who were managed expectantly delivered preterm. Out of the 8 patients who underwent encerclage four (50%) delivered preterm and four (50%) reached up to term. There was no significant difference in the outcome in patients who underwent encerclage (Fig7/ Table7). The results were consistent with other studies done by Berghella. V *et al*[9], N Brix*et al*[10] and Lancet *et al*[11]. Preterm delivery inspite of encerclage occurred in four cases, two of them had cervical length 1.9 cm and 2cm respectively. Out of these four patients internal os was found to be open in three patients at the time of scan and they delivered preterm. Similar results were seen in studies done by Kore SJ *et al*[4]. Four patients in which expectant management was done OS was closed at the time of scan. The effectiveness of encerclage was not statistically significant in my study, but it might contribute in decreasing the incidence of preterm delivery (Fig8/Table8). The precise mechanism by which encerclage confers a benefit is unknown but it may support the immunological barrier between the chorio-amnion-extraoval space and the vaginal microbiological flora. There was a correlation between short cervix with

os open at the time of scan and preterm delivery. In my study, majority i.e. 80% delivered full term between 37-40 weeks, 7% delivered post expected date of delivery between 40-42 weeks, 11% delivered moderate to late preterm between 32-37 weeks, 1% delivered early preterm between 28-32 weeks and another 1% delivered extremely preterm between 24-28 weeks (Fig9 and 10/ Table9 and 10). In my study 94.7% of pregnant women set into spontaneous labour, whereas in 5.3% of the cases, induction of labour was done for various reasons. Among the subjects studied only 3 % cases had prelabour rupture of membranes, whereas in 97% cases membranes ruptured in the process of labour. In this study, 83.9% delivered through vaginal route, whereas 16.1% had to undergo caesarean section for varied indications. In 3.4% of the cases outlet forceps were used. None of the patients in this study had any complications during delivery. In my study 87% delivered after 37 weeks of gestation, whereas preterm birth was seen in 13% (Fig 11/Table 11). This is similar to the national average preterm birth rate of India according to Lancet study, which is 13% of the total births. In my study majority of the babies i.e. 75% had their birth weights between 2.5 kg to 3.5 kg (Fig12/Table 12). Mean birth weight in our study group was 2.8 kg, which is close to our national average birth weight of 2.8 kg. About 21% of the babies born had low birth weight between 1.5-2.5 kg, whereas 1% had very low birth weight of <1.5 kg attributing mainly to preterm birth. Birth weight of 3.5-4.5 kg was seen in 3% of the babies (Fig13/ Table13). In this study, APGAR score at 1st minute was ≤7 in 6% of the babies, out of which 66.7% were preterm birth and 33.3% were full term births.

In this study 6% of the babies required immediate NICU admission mostly for preterm care and for respiratory distress. There was 2% fetal mortality whereas 94% of the babies were shifted to mother side after birth. In group A, 1 neonatal mortality occurred due to respiratory distress. In group B also, there was 1 neonatal mortality due to extreme prematurity (28 weeks) and respiratory distress. In this study, among those who delivered extreme to early preterm, i.e. <32 weeks of gestation, 100% had cervical length of ≤ 2.5 cm. Among those who delivered moderate to late preterm, i.e. between 32-36 weeks of gestation, 54.5% had cervical length of ≤ 2.5 cm, 81.8% had cervical length of ≤ 3 cm, whereas 100% had cervical length of ≤ 3.5 cm. Among those with cervical length of ≤ 2.5 cm, preterm delivery occurred in 66.67% of women, whereas 33.33% delivered full term. Among those with cervical length of ≥ 2.5 cm, preterm delivery occurred in 5.7% of women, whereas 94.3% delivered full term. Among those with cervical length of ≤ 3 cm, preterm delivery occurred in 40.7% of women, whereas 59.3% delivered full term. Among those with cervical length of ≥ 3 cm, preterm delivery occurred in 3.9% of women, 96.1% delivered full term. Therefore a cut-off value of ≤ 2.5 cm cervical length is better predictor of preterm delivery. Whereas in similar studies by Hebbar *et al*[1] used a cut-off value of ≤ 25 mm, Iams *et al*[8] used a cut-off value of ≤25 mm and Taipale *et al*[12] used cut off value of ≤ 25mm. In similar studies, P. Arora*et al*[7] used a cut-off value of ≤ 30mm. In our study, when cervical length cut-off of ≤ 2.5 cm was applied for predicting preterm delivery, sensitivity was 61.54%, specificity was 95.4%, PPV was 66.67%, NPV was 94.32%. In a similar study by Jay D. Iams*et al*[8] at ≤25mm cut off, sensitivity was 37.3%, specificity was 92.2%, PPV was 17.8%, NPV was 97%. In another similar study by P. Arora*et al*[7] at ≤25mm cut off, sensitivity was 31.3%, specificity was 100%, PPV was 100%, NPV was 88.4%. In a study conducted by Hebbar *et al*[1] at ≤25mm cut off sensitivity was 77%, specificity was 95 %, PPV was 56 % and NPV was 98 %. In another similar study by Taipale *et al*[12] at ≤ 25mm cut off sensitivity was 6%, specificity was 100%, PPV was 39%, NPV was 99%. In our study, when cervical length cut-off of ≤ 3 cm was applied for predicting preterm delivery, sensitivity was 84.62%, specificity was 81.61%, PPV was 40.74%, and NPV was 97.26%. In a similar study by Iams *et al*[8] at a cut off value of ≤ 30mm, sensitivity was 54%, specificity was 76.3%, PPV was 9.3%, NPV was 97.4%. In similar study by P. Arora *et al* [7] at a cut off value of ≤ 30 mm the sensitivity was 53.13 % specificity was 79.7%, PPV was 33.3% and NPV was 89.9%. In this study, cervical length with cut-off point ≤ 2.5 cm predicted preterm labour with P-value of < 0.001 indicating strong statistical significance. Cervical length cut-off of ≤ 3 cm also predicted preterm labour with P-value of < 0.001 indicating strong statistical significance. As the cut-off point was increased, the sensitivity increased but the specificity and the PPV decreased which is comparable to the results of similar study done by P.Arora *et al*[7].

CONCLUSION

Our findings confirm those of previous studies that have found an inverse relation between the length of the cervix, as measured by transvaginal ultrasonography during pregnancy, and the frequency of preterm delivery. We found that the cervical length measured at 18–24 weeks in asymptomatic women with singleton pregnancies was useful for identifying patients at increased risk for preterm delivery. Mean value of cervical length in pregnant women at 18-24 weeks of gestation in our study was 3.4 cm. There is a definite correlation between short cervical length and occurrence of preterm delivery. Our data suggests that the length of

the cervix is an indirect indicator of its competence and should be seen as a continuous rather than a dichotomous variable. The length of the cervix is directly correlated with the duration of pregnancy: the shorter the cervix, the greater the likelihood of preterm delivery. Considering the magnitude of preterm labour, cost of management of preterm babies and morbidity-mortality associated with it, transvaginal ultrasonography of the cervix during routine anomaly scan has emerged as a safe, acceptable and a cost-effective test to assess risk of preterm delivery.

LIMITATIONS

The predictive value can be further enhanced by calculating „cervical index" as proposed by Gomez *et al*[13]. Correlation with increased levels of fetal fibronectin can increase the predictive value of this method.

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