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A prospective study of ultrasound assessment of cervical length in predicting preterm birth in women between 18 to 24 weeks of gestation

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Abstract
Introduction: Preterm delivery continues to be a significant obstetric problem in view of prematurity complication that an immature newborn develops. Cervical length is considered to be one of the important predictors of risk of preterm delivery. In the era of ultrasound, imaging transvaginal ultrasound assessment of cervical length is more accurate than other methods.
Aims and Objectives: To assess relation of cervical length at 18 - 24 wks of gestation in singleton pregnancies and its relation to preterm labor.
Materials and Methods: A prospective follow up study conducted in Al Ameen medical college for a period of 20 months from November 2017 to June 2019. About 200 cases were followed up to find out potential value of routine measurement of cervical length in singleton pregnancies between 18 - 24 wks gestation to the prediction of risk for spontaneous preterm delivery.
Inclusion Criteria: All singleton pregnancy who have correct dating either by reliable LMP in the background of regular menstrual cycle or dating scan who have come for anomaly scan between 18-24wks of GA who agree for transvaginal measurement of cervical length.
Exclusion Criteria: Cases not willing for transvaginal ultrasound measurement of cervical length. Multiple gestation. History of previous uterine and cervical surgeries. Cases who developed preterm labor due to obstetric complication that is iatrogenic preterm.
Results: Out of 200 pregnancies followed 35 had preterm labor.13 cases were excluded due to obstetric complications.15 out of 22 cases had cervical length <3cm. Incidence of preterm in study group 11%. Number of preterm babies required neonatal admission was 14 .Sensitivity is 59.1% and Specificity is 97.6%. Positive predictive value is 76% with Negative predictive value is 94.7% and accuracy of 93%. P value < 0.001 which is significant.
Conclusion: Ultrasonographic cervical measurement is safe and effective technique to predict increased risk of preterm delivery.

Keywords: ultrasound, gestation age, cervical length.

1. Introduction

Preterm labour is an important problem associated with high perinatal mortality and morbidity. According to World Health Organization as the onset of labour in patients before 37 weeks of gestation in a pregnancy beyond 20 weeks of gestation[1]. The viability period varies from 20 to 28 weeks in different countries depending on the facilities available for newborn. Strategies for reducing the incidence of preterm labour and delivery have focused on educating both physicians and patients about the risks for preterm labour and methods of predicting and predicting preterm labour.

About 40 to 50% of preterm birth occur due to spontaneous preterm labour, 30% result from preterm pre labour rupture of membranes and the rest 30% are iatrogenic termination which benefits both mother and fetus [2]. Gestational Hypertension, IUGR, antepartum hemorrhage and isoimmunization etc comes in this type iatrogenic termination.

The incidence of preterm labour globally according to WHO is about 10%. Developing countries like Africa and southern Asia may contribute more (11 to 15%) to this load [3]. Late preterm birth which is between 34weeks to 36weeks 6days accounts for about 74% of all preterm labor. This rate has been constant since 2 decades. A lot of variation is seen in early preterm which is below 32 weeks of gestation age. The perinatal mortality rate (PNMR) is 26. A lot of efforts are put to steadily decline the PNMR. But a lot to be achieved yet to match PNMR

of developed countries like USA where PNMR has reduced to 6 [4].

Early detection of pregnant women who will deliver before term has been sought as an avenue to reduce the occurrence of prematurity-related perinatal morbidity. Preterm birth is associated with 75% of perinatal morbidity and mortality for infants born without congenital anomalies. The rates of preterm birth have actually been increasing in the developed countries as high risk mothers dare to become pregnant and their fetuses are salvaged in recent years despite widespread efforts to address the problem. Many factors contribute to increasing incidence of preterm labor are increased rates of multiple gestation, assisted reproductive techniques and increased birth in older women (>35yrs). Antepartum fetal surveillance with intervention in high risk pregnancy has increased preterm birth with decreased stillbirths. Tremendous advancement achieved in neonatal services has also contributed to preterm labor. Therefore management of prematurity is team effort of both obstetrician and the neonatologist.

2. Materials and Methods

200 pregnant women with singleton pregnancy who attended outpatient department or admitted for antenatal care in department of obstetrics and gynecology of Al Ameen medical college, Vijayapur between November (20 months) were studied. Inclusion criteria followed were singleton pregnancy, gestational age between 18 to 24 weeks, with informed consent to undergo transvaginal scan. The exclusion criteria multiple pregnancy, previous cervical or uterine surgeries.

The women selected for the study were counseled and informed written consent for the procedure was obtained after explaining in the procedure in detail. Detailed history of patient was taken. After the woman emptied the bladder, a clean probe covered with the condom was inserted and guided into the anterior fornix of vagina and sagittal long axis view of Endocervical canal along with entire length of the canal was obtained. The probe was withdrawn until the image was blurred and just enough pressure was reapplied to restore the image so that excessive pressure on cervix, which can elongate it, can be avoided. The image was then enlarged so that cervix occupied at least two thirds of the image and both the external and the internal os were seen. the length of the cervix from the external to the internal os was measured along the Endocervical canal. Three measurements were obtained and the best short measurement was recorded. All the pregnant women were followed till delivery.

3. Results

200 women between 18- 24 weeks of gestation who fulfilled the selection criteria were recruited for the study. 35 cases had preterm labor. 13 cases had obstetric complications for which they had iatrogenic preterm labor, they were excluded from study.

Incidence of preterm were observed in 22 cases, which was about 11.2% of cases.

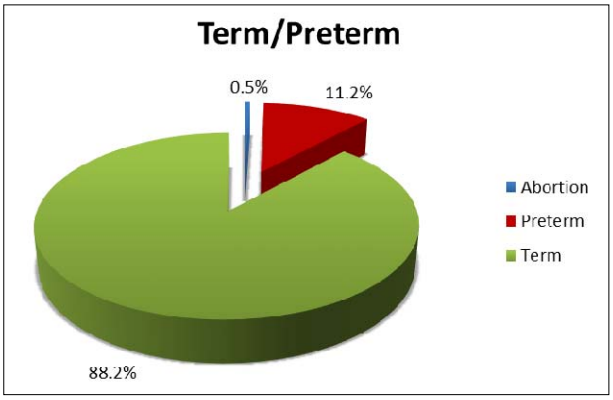

Fig 1: Distribution of Cases According to Term/Preterm

In this study 22 pts had preterm labor which is about 11.2% of patient in the study group.

Most of the patients in the study group were between 21-25yrs of age group, it accounts to about 56.1% of the study population.

Table 1: Distribution of Age According to Term/Preterm

Age (yrs)	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
≤20	5	22.7%	37	22.4%	42	22.5%	0.873
21-25	12	54.5%	93	56.4%	105	56.1%	
26-30	4	18.2%	32	19.4%	36	19.3%	
>30	1	4.5%	3	1.8%	4	2.1%	
Total	22	100.0%	165	100.0%	187	100.0%	

In the study majority of pts were in age group 20 - 25 yrs (54%) study group and 56% in control group.

Most of the patients in the study were multiparous women which is about 67.9% of the patient.

Table 2: Distribution of Parity Index According to Term/Preterm

Parity Index	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
Multi	17	77.3%	110	66.7%	127	67.9%	0.317
Primi	5	22.7%	55	33.3%	60	32.1%	
Total	22	100.0%	165	100.0%	187	100.0%	

Preterm labor was seen in multiparous women which is about 77.3% and term labor in 66.7% of multiparous women.

In our study the cervical length was distributed between 2 to 4.8 cm. 5 pts had cervical length below 2.5cm, all of them had preterm labor. About 12 pts had cervical length between 2.5cm to 3cm, 8 pts had preterm labor.

Table 3: Distribution of Cervical Length According to Term/Preterm

Cervical length(cm)	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
2-2.5	5	22.7%	0	0.0%	5	2.7%	<0.001*
2.5-3.0	8	36.4%	4	2.4%	12	6.4%	
3.0-3.5	9	40.9%	86	52.1%	95	50.8%	
3.5-4.0	0	0.0%	57	34.5%	57	30.5%	
≥4.0	0	0.0%	18	10.9%	18	9.6%	
Total	22	100.0%	165	100.0%	187	100.0%	

Note: *significant at 5% level of significance (p<0.05)

Our study showed out 22 pts who had preterm labor, 13 pts had cervical length of less than 2.9cm which accounts to about 59.1% of the preterm labor.

Table 4: Distribution of Cervical Length Cutoff According to Term/Preterm

Cervical length(cm)	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
≤2.9	13	59.1%	4	2.4%	17	9.1%	<0.001*
>2.9	9	40.9%	161	97.6%	170	90.9%	
Total	22	100.0%	165	100.0%	187	100.0%	

Note: *significant at 5% level of significance (p<0.05)

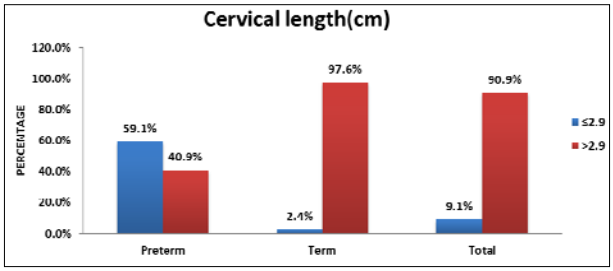

Fig 2: Distribution of Cervical Length Cutoff According to Term/Preterm

Using a cervical threshold of 2.9cm and spontaneous preterm birth before 37 weeks of gestation as reference standard the sensitivity, specificity, positive predictive value and negative predictive value and accuracy of our study are 59.1%, 97.6%, 76.5%, 94.7%, 93.0% respectively.

Table 5: Sensitivity of Cervical Length Cutoff

Sensitivity	59.1%
Specificity	97.6%
PPV	76.5%
NPV	94.7%
Accuracy	93.0%

Study showed sensitivity of 59.1% and specificity of 97.6%. Positive predictive value of 76.5% and negative predictive value of 94.7% with accuracy of 93%.

In our study out of 22 pts who had preterm labour, 18 pts had preterm vaginal delivery and 4 pts of LSCS.

Table 6: Distribution of N.L/LSCS According to Term/Preterm

N.L/LSCS	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
FTND	0	0.0%	108	65.5%	111	59.4%	<0.001*
LSCS	4	18.18%	54	32.7%	57	30.5%	
PTVD	18	81.81%	0	0.0%	15	8.0%	
VBAC	0	0.0%	3	1.8%	3	1.6%	
Total	22	100.0%	165	100.0%	187	100.0%	

Note: *significant at 5% level of significance (p<0.05)

About 18.18% of women had LSCS with rest 81.81 had preterm vaginal delivery. Whereas 65.5% of women had LSCS in term delivery with 32.7% having normal delivery and 1.8% had VBAC.

In our study 8 babies of preterm labor were admitted to NICU.

Table 7: Distribution of NICU Admission According to Term/Preterm

NICU admission	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
Admitted	8	36.4%	22	13.3%	30	16.0%	**<0.001***
No	14	63.6%	143	86.7%	157	84.0%	
Total	22	100.0%	165	100.0%	187	100.0%	

Note: *significant at 5% level of significance (p<0.05)

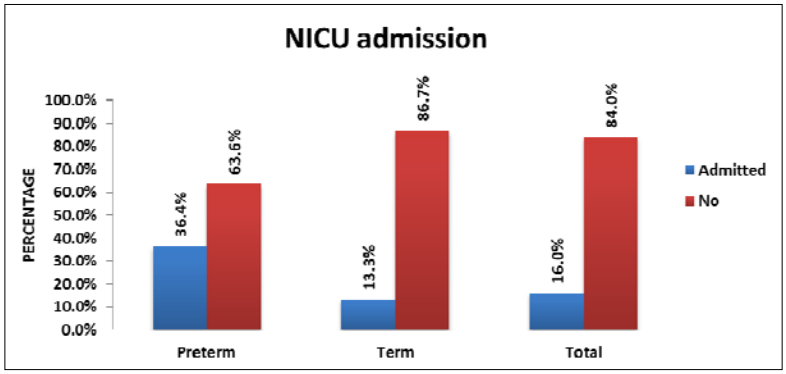

Fig 3: Distribution of NICU Admission According to Term/Preterm

Table 8: Distribution of Indication According to Term/Preterm

Indication	Term/preterm				Total		p value
	Preterm		Term				
	N	%	N	%	N	%	
Delayed cry	0	0.0%	2	1.2%	2	1.1%	<0.001*
Fetal distress	7	31.8%	5	3.0%	12	6.4%	
IUGR	1	4.5%	1	0.6%	2	1.1%	
Laryngeal edema	0	0.0%	1	0.6%	1	0.5%	
Meconium aspiration	0	0.0%	11	6.7%	11	5.9%	
Ventriculomegaly	0	0.0%	1	0.6%	1	0.5%	

Note: *significant at 5% level of significance (p<0.05)
7 babies had fetal distress in preterm category with 1 baby having IUGR.

4. Discussion

Preterm birth posses a major health burden to the society due to its association with long term morbidity, perinatal mortality and high financial expenditure. It is responsible for more than half of all neonatal deaths. Moreover, of late, the incidence of preterm birth is on the rise in spite of good perinatal care. Predicting spontaneous preterm labor will help in early intervention and improvement of outcome.

Transvaginal sonography can be used as a reliable and cost effective screening procedure in both low and high risk asymptomatic patients at 18 to 24 weeks with short cervix. A number of studies have proved in the role of cervical assessment by sonography in prediction of preterm labour as. Evidence says that cervical length starts to shorten sometime after 15weeks of gestation in women who subsequent deliver preterm (mean 18weeks).

In this study the sensitivity of cervical length measured by transvaginal ultrasonography (18-24weeks) in predicting preterm labour in asymptomatic women with a cut off <30mm is 59% and specificity is 97%. The positive predictive value is 76%, but the negative predictive value is 94% which is very reassuring. A woman with a cervical length <29mm at 18-24 weeks with no other complications has a probability of 59% to deliver preterm. On doing the chi-square test, the P value obtained is <0.001 which is significant.

In study by Hincz P *et al*. where cervical length was measured in second trimester had sensitivity of 57.1%, specificity of 92.6%, PPV of 61.5% and NPV 91.3% with cervical length of 2 to 3 cm [6].

The incidence of preterm labor in our study is 11% which is near to other studies Davies *et al*, in a Canadian, prospective observational study on 964 women with cervical length measurement in second trimester had preterm labor incidence of 8%, sensitivity of 57% and specificity of 82% for preterm birth with cutoff of cervical length of 3cm [7].

In study by Lim *et al*. transvaginal ultrasound for the measurement of cervical length was reported to be a effective, safe and acceptable technique in predicting preterm labor. Cervical length was reported to be inversely related to the risk of preterm labor in asymptomatic women [8].

It was also found in the study that 36% of babies low prematurely required neonatal intensive care unit admissions for various reasons like low birth weight, delayed cry, IUGR, meconium aspiration, asphyxia, respiratory distress, poor feeding and weight gain. Whereas only 13% of babies born at term required neonatal admissions which coincides with other studies and helps us in delivery of such patients in higher centers with good NICU facilities.

5. Conclusion

Ultrasonographic assessment of the cervix has a promising role to offer in the prediction of the risk of developing preterm labour. Considering the magnitude of preterm labour, cost of management of preterm babies and morbidity and mortality associated with it, the use of Sonographic assessment of cervix at 18 to 24 weeks as a routine screening method is cost effective and should be offered to all pregnant women [9].

Although the use of predictors does not reduce the incidence of preterm birth it definitely helps to identify people at risk and helps us opt for better treatment strategies. It also helps us avoid over diagnosing preterm labour and administering overzealous treatment [10].

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