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MID TRIMESTER CERVICAL LENGTH MEASUREMENT BY TRANSVAGINAL ULTRASOUND AS A PREDICTOR OF PRETERM DELIVERY

Savitha Keranahalli Basanna[1], Ravi Gowda[1], Divakar[2]

[1]Professor, Department of OBG, J J M Medical College, Davangere Karanataka India
[2]Assistant Professor, Department of OBG, JJ M Medical College, Davangere, Karanataka, India

Abstract

Background: The role of cervical length measured by transvaginal ultrasound as a predictor of preterm delivery in asymptomatic women at gestational age of 18-24weeks. The objective is to measure cervical length by transvaginal ultrasound. To categorize patients into study and control group. To assess maternal and foetal outcome. **Materials and Methods:** A Prospective analysis study was conducted at Department of Obstetrics and Gynecology in the year 2019-2021. Routine antenatal patients presenting in OPD at 18-24weeks of gestation were included in the study and cervical length was measured by transvaginal ultrasound after detailed history and examination and obtaining consent from the patient. **Result:** In this study about 200 women with asymptomatic singleton pregnancy were involved. Study group: 100 women with cervical length less than 25mm. Control group: 100 women with cervical length more than 25mm. **Conclusion:** Cervical length is found to predict the risk of preterm delivery in asymptomatic women. Transvaginal ultrasound is found to be effective, safe, simple, non-invasive OPD procedure that can be used to measure cervical length. As preterm delivery is associated with perinatal morbidity and mortality, it becomes mandatory to find effective screening techniques that help us to predict and to involve in effective management.

INTRODUCTION

In India, about 27 million babies are born every year. Among them 3.5million babies are preterm (2010 data). In low-income countries 12%babies are preterm compared to high income countries which is 9%. Survival rate of preterm babies too depends on the countries in which they are born. As in developing countries 50%mortality of infants born below 32 weeks. This occurs due to lack of cost effective and basic care, whereas in developed countries 90% of infants survive. Unfortunately India being the developing country contributes the largest number of premature related death about 25% globally.[1]

Preterm delivery is the presence of uterine contraction of sufficient intensity and frequency that causes progressive cervical dilatation and effacement between period of viability and 37completed weeks or 259 days of gestation. Premature birth is the number one cause of newborn death and second most common leading cause of death of children under 5 years of age. Not only it causes mortality it also drastically increases neonatal morbidity as premature babies are more prone for cerebral palsy, learning disability, respiratory distress, neonatal sepsis, intraventricular haemorrhage, hypoglycemia, necrotising enterocolitis, retinopathy of prematurity, hyperbilirubinemia, pneumonia.[2,3]

Although premature deliveries are increased dramatically due to induction and cesarean section for maternal and foetal indications, about 70-80% preterm birth occurs spontaneously. However, recently neonatal intensive care has been improved dramatically that decreased the neonatal mortality.[4] So, as an obstetrician effort should be surely made to understand the factors that predicts the spontaneous onset of preterm delivery in-order to decrease the morbidity and mortality. This study also focuses to predict the spontaneous onset of preterm delivery based on cervical length measurement as it could be cost effective, feasible and if possible could be used as screening test in all pregnant women.

MATERIALS AND METHODS

A Prospective analysis study was conducted at Department of Obstetrics and Gynecology in the year 2019-2021. Routine antenatal patients presenting in OPD at 18-24weeks of gestation were included in the study and cervical length was measured by transvaginal ultrasound after detailed history and examination and obtaining consent from the patient.

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Cervical length was measured from internal os to external os along the endocervical canal. Minimum of three readings were taken and shortest of three was recorded.

Based on cervical length in asymptomatic women patients were divided into 2 groups GROUP A:100 patient with cervical length <25mm.

GROUP B:100 patient with cervical length >25mm.

Inclusion criteria

Asymptomatic women of singleton pregnancy.

Exclusion Criteria

• Multiple pregnancy Placenta previa
• History of cervical encerclage Hydromnios
• Previous history of abortion
• Severe preeclampsia Induced pregnancy

Statistical Analysis

SPSS (Version 22.0) was used for analysis. The mean and standard deviation were determined for quantitative data. Descriptive statistics was used, proportion was calculated.

RESULTS

As per [Table 1] among the women enrolled in study, minimum age group involved is 18, maximum age group is 34 with mean age group is 24.83. Women at age group of less than 20 with short cervical length shows higher rate of preterm delivery in comparison with control group. Among 22 women at age less than 20, 15 women are with cervical length less than 25mm and 11 women delivered at preterm. Considerably women with age of more than 30 also shows mild increase in preterm delivery,54.5% when compared to study group.

As per [Table 2] in this study, about 123 women are primigravida and 77 women are multigravida. No significant changes in cervical length are noted based on parity. The minimum and maximum cervical length measured is 16mm and 50mm with mean cervical length of about 28mm.The difference between the mean cervical length between two group is statistically significant with p value of <0.0001.
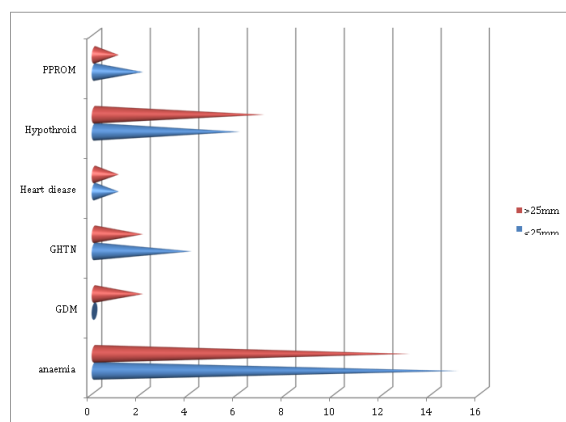

Figure 1: Risk factors and Cervical length

As per [Table 3] women with anaemia in study population is around 15 while in control group is 13, among the study group only 7 are delivered at

preterm and the rest are delivered at term. In control group among 13, eleven patient delivered at term, Hence though it is a confounding factor it does-not seem to rise the preterm delivery. PPROM, in study group accounts for 66% and resulted in preterm delivery wheres as in control group only one patient had complication as PPROM and delivered prematurely. All women associated with PPROM delivered as preterm. Women with GHTN is found to deliver at late preterm, in study group 50% delivered prematurely and in control group 15% delivered as preterm.

As per [Figure 1] women with confounding factors in addition with cervical length <25mm is found to increase the chance of preterm.

[Table 4] in this study, about 140 women delivered by labour naturalis, 2 women delivered through assisted beech, LSCS are done in 44 women with predominant cause being done in suspicion of foetal distress, 4 delivered through outlet forceps and 10 women delivered by vaccum forceps.
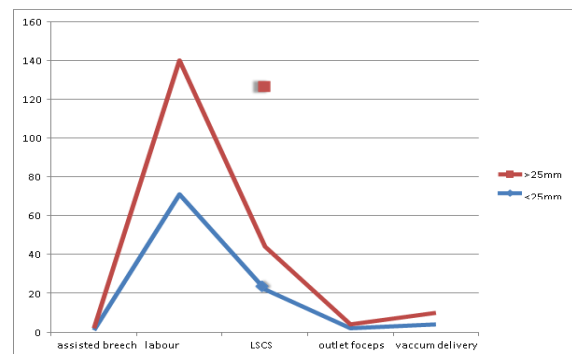

Figure 2: Mode of Delivery

In study group, 1 women delivered by assisted breech,3 delivered through outlet forceps, 22 delivered by Lscs,45 delivered by labour naturalis. Totally 71 women given birth to preterm baby. This graph show that mode of delivery does not varies among women based on their cervical length and it always depends on maternal and foetal risk factors.
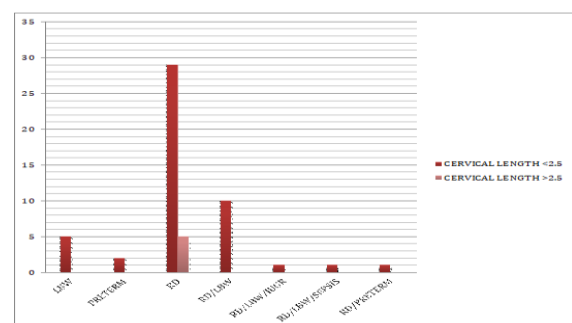

Figure 3: Cervical Length and risk factors for babies

As per [Table 5] in this study one patient enrolled with cervical length less than 25mm delivered before 28weeks.Sensitivity and specificity of test is more in patients with risk of early preterm.

As per [Table 6] among 200 women, 13 women who had cervical length less than 25mm delivered at less

than 34 weeks in study group and 87 women delivered after 34 weeks. In control group only one patient with cervical length greater than 25mm delivered at gestational age less than 34 week.

As per [Table 7] in this study, among 100 women with cervical length less than 25mm, 71women delivered as preterm and 29 women delivered as term whereas it is inverse in control group ,71women delivered as preterm and 29 women delivered as term. This indicates cervical length as good predictor of preterm birth.

As per [Table 8] four babies born with weight of less than 1.5 kg all of them with cervical length less than 25mm delivered before 34 weeks indicating risk of low birth weight in preterm.

As per [Table 9] mean baby weight in women with cervical length less than 25mm 2.51 and in women with cervical length more than 25mm is 2.74 and the result is statistically significant with p value of less than 0.0001.

[Figure 3] shows that neonatal complications such as low birth weight, respiratory distress, IUGR and multiple complications in single baby are common in those with cervical length less than 25mm.

Table 1: Age Distribution of the Study Participants

AGE	Frequency	Percent
<20	22	11.0%
21-25	99	49.5%
26-30	68	34.0%
>31	11	5.5%
Total	200	100.0%

Table 2: Obstetric code

			Cervical Length		Total
			<2.5	>2.5	
OBS.CODE	Multi	Count	40	37	77
		% within OBS.CODE	51.9%	48.1%	100.0%
	Primi	Count	58	63	123
		% within OBS.CODE	50.4%	49.6%	100.0%
Total		Count	100	100	200
		Within OBS.CODE	51.0%	49.0%	100.0%

Table 3: High risk factors with Cervical Length

			Cervical Length		Total
			<2.5	>2.5	
HIGH RISK	Anaemia	Count	15	13	28
		% within HIGH RISK	53.6%	46.4%	100.0%
	GDM	Count	0	2	2
		% within HIGH RISK	0.0%	100.0%	100.0%
	GHTN	Count	4	2	6
		% within HIGH RISK	66.7%	33.3%	100.0%
	Heart disease	Count	1	1	2
		% within HIGH RISK	50.0%	50.0%	100.0%
	Hypothyroid	Count	6	7	13
		% within HIGH RISK	46.2%	53.8%	100.0%
	Nil	Count	72	74	146
		% within HIGH RISK	49.3%	50.7%	100.0%
	PPROM	Count	2	1	3
		% within HIGH RISK	66.7%	33.3%	100.0%
Total		Count	100	100	200
		% within HIGH RISK	50.0%	50.0%	100.0%

Table 4: Mode of Delivery

Mode of delivery	Frequency	Percent
Assisted breech	2	1.0%
Labour natural	140	70.0%
LSCS	44	22.0%
Outlet forceps	4	2.0%
Vacuum	10	5.0%
Total	200	100.0%

Table 5: Gestational age at delivery

			GA at delivery		Total
			<28	>28	
Cervical length	<2.5	Count	1	99	100
		% within cervical length	1.0%	99.0%	100.0%
	>2.5	Count	0	100	100
		% within cervical length	0.0%	100.0%	100.0%

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			1	199	200
Total		Count	1	199	200
		% within cervical length	0.5%	99.5%	100.0%

Table 6: Cervical Length and Gestational Age (< and >34 weeks)

			GA at delivery		Total
			<34	>34	
Cervical Length	<2.5	Count	13	87	100
		% within cervical length	12.7%	87.3%	100.0%
	>2.5	Count	1	99	100
		% within cervical length	1.0%	99.0%	100.0%
Total		Count	14	186	200
			7.0%	93.0%	100.0%

Table 7: Cervical Length and Gestational Age (< and >37 weeks)

			GA at delivery		Total
			>37	<37	
Cervical Length	<2.5	Count	29	71	100
		% within Cervical Length	28.4%	71.6%	100.0%
	>2.5	Count	71	29	100
		% within cervical length	71.6%	28.4%	100.0%
Total		Count	100	100	200
		% within cervical length	50.0%	50.0%	100.0%

Table 8: Baby Weight

Baby Weight	Frequency	Percent
<1.5	4	2.0
1.6-2.5	73	36.5
>2.6	123	61.5
Total	200	100.0

Table 9: Mean cervical length

Cervical Length		Mean	Std. Deviation	P value
Baby Weight	<2.5	2.51	0.44	<0.0001
	>2.5	2.74	0.33	

Table 10: Predictive value in women with cervical length <25mm

GA At delivery	Sensitivity	Specificity	PPV	NPV	RR
<28	100.00%	49.25%	9.8%	100.00%	2.88
<34	92.86%	52.15%	12.75%	98.98%	12.49
<37	67.82%	61.95%	57.84%	71.43%	2.02
>37	29.59%	28.43%	28.43%	29.59%	0.4

The positive predictive value, negative predictive value, sensitivity and specificity of patients with cervical length <25mm in patients delivered before 28 weeks of gestation in low-risk population is 9.8%,100%,100%,49.25% respectively. Relative risk is about 2.88. The positive predictive value, negative predictive value, sensitivity and specificity of patients with cervical length <25mm in patients delivered before 34weeks of gestation in low-risk population is 12.75%, 98.98%, 92.86%, 52.15% respectively. Relative risk is about 12.49. The positive predictive value, negative predictive value, sensitivity and specificity of patients with cervical length <25mm in patients delivered before 37weeks of gestation in low-risk population is 57.84%, 71.43%, 67.82%, 61.95% respectively. Relative risk is about 2.02. The positive predictive value, negative predictive value, sensitivity and specificity of patients with cervical length <25mm in patients delivered after 37weeks of gestation in low-risk population is 28.43%,29.59%,29.59%,28.43% respectively. Relative risk is about 0.4.

DISCUSSION

In study done by Visintine et al concluded that women with recurrent prior induced abortion had three-fold rise in preterm delivery in comparison with singleton pregnancy.[5]

Iams et al in 1996 conducted a study involving 2915 pregnant women and found an inverse relationship between the length of cervix measured by ultrasonography and preterm delivery. Transvaginal ultrasound was done at 24weeks of gestation and results showed positive predictive value of 18%and negative predictive value of 97%.Although predictive value is low it is found to be raised with prematurity.[6]

In 2000, Hibbard et al in 760 pregnant women conducted a Prospective observational study in which transvaginal ultrasound was done between 16-24weeks. Eighty-five delivered before 37weeks, fifty-one before 35weeks and twenty-seven before 32weeks. Relative risk of spontaneous preterm delivery before 37weeks, 35 weeks and 32 weeks were 3.8,4.5and 5.2 respectively. Sensitivity was 13-44%, Specificity was 90-99%, positive predictive

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value of 15-47%, negative predictive value of 80-98%.[7]

Owen et al also conducted study in 183 women and supported the length of cervix is an indicator of cervical incompetency hence relationship between cervical length and spontaneous preterm delivery should be studied. Positive predictive value is higher in this study it can be due to more number of pregnant women with previous history of spontaneous preterm delivery were included in this study.48women had spontaneous preterm birth before 35weeks and concluded cervical length measurement predicts preterm birth in high risk women.[8]

Fukami et al at 2003 also conducted large prospective study involving 3030 women and measured cervical length between 16-19weeks. The overall preterm delivery is 0.3%in <32weeks and 2.9% between 32-36weeks.Senitivity, specificity, positive predictive value, negative predictive value of cervical length for predicting peterm birth before 32 weeks were 50%, 98.5%, 8.3%, 99.9%. In preterm birth after 32weeks the above parameters were 18.2%,98.9%,33.3% and 97.6%.[9]

In 2006, Hebber et al also conducted a prospective study in India involving 200 pregnant women who were low risk asymptomatic singleton pregnant women. Only 33% of pregnant women with cervical length of <25mm delivered beyond term and about 87.5%of women with cervical length>25mm delivered after term women with cervical length <2mm are excluded from study and cervical cerclage done.[10]

In 2016 Preeti et al also conducted a study in 100 high risk asymptomatic women in which cervical length is measured by transvaginal ultrasound and had positive predictive value and negative predictive value in women with cervical length <25mm at <28weeks were 6% and 100%, <32weeks were 16% and 100%, <34weeks were 30% and 98% and <37weeks were 50% and 86% respectively.[11]

In this study, measurement of cervical length is found to be a good indicator in asymptomatic low risk women who has risk of delivery at early preterm with positive and negative predictive value of 0.9% and 100% at <28weeks and 12.75% and 98.98% at <34weeks,57.84% and 71.43% at <37weeks 57.84 % and 71.43%.Neonatal outcome in study group is associated with great morbidities such as respiratory distress, lowbirth weight, sepsis, neonatal jaundice, longer NICU admission and increase mortality rate when compared to control group.

Even though cervical length measurement as indicator of preterm is accepted in high-risk women, its routine use in antenatal women with the help of transvaginal ultrasound is still in debate. However cervical length shortening can be seen in women who are in imminent danger of onset of preterm delivery, and found that earlier the onset of cervical shortening there is much greater chance of preterm delivery.

CONCLUSION

Cervical length is found to predict the risk of preterm delivery in asymptomatic women. Transvaginal ultrasound is found to be effective, safe, simple, non-invasive OPD procedure that can be used to measure cervical length. As preterm delivery is associated with perinatal morbidity and mortality, it becomes mandatory to find effective screening techniques that help us to predict and to involve in effective management. Though incidence of preterm is less in low-risk population, if spontaneous onset of labour is anticipated at early gestation, all measures that helps in delaying labour and to increase lung maturity and neuro-protection can be done. Thereby morality in preterm birth can be reduced drastically. Universal screening of cervical length can be implemented as it helps in considerable reduction in neonatal mortality and morbidity.

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