



ORIGINAL RESEARCH PAPER

Obstetrics & Gynaecology

A STUDY OF ULTRASONIC ASSESSMENT OF CERVICAL LENGTH AND AMNIOTIC FLUID INDEX IN PREDICTING DELIVERY LATENCY FOLLOWING PREMATURE PRETERM RUPTURE OF MEMBRANES

KEY WORDS: -Preterm premature rupture of membranes, latency period, Transvaginal cervical length, Amniotic fluid index, Prediction of preterm delivery

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ABSTRACT

Preterm premature rupture of membrane (PPROM) is among the most important causes of perinatal morbidity and mortality. We sought to determine whether cervical length and amniotic fluid index, individually or in combination, can predict the pregnancy outcome in cases of PPRM. Prelabor rupture of membranes (PROM) occurs when the fetal membranes rupture before the onset of labor contractions. This condition can lead to spontaneous labor or, if labor does not begin, increase the risk of complications such as intraamniotic infection and placental abruption, particularly at term. When PROM occurs before 37 weeks gestation, it is classified as preterm PROM (PPROM), posing unique challenges in managing the risk of prematurity alongside potential complications for the mother and child. PROM can arise from various causes, including membrane weakening, intraamniotic pressure, infection, and other stressors—with risk factors like a history of PROM, short cervical length, and certain lifestyle factors. Management depends largely on gestational age, with delivery often recommended after 37 weeks and more conservative approaches taken for PPRM to balance fetal development with the risk of infection.

INTRODUCTION

Preterm premature rupture of membranes (PPROM) is defined by spontaneous rupture of the fetal membranes before 37 completed weeks and prior to labor onset. The incidence of PPRM is approximately 3% of all pregnancies. In a term pregnancy, membrane rupture can result from shearing force due to uterine contractions and weakened state by physical stretching. India is the biggest contributor to the world's prematurity burden with almost 3.6 million premature births accounting for 23.6% of around 15 million global preterm births reported each year (WHO). Preterm premature rupture of membrane (PPROM) is a breach in the chorioamniotic membrane prior to the onset of labour at <37 weeks of gestation. PPRM complicates 3% of all deliveries and is associated with 30-40% of preterm deliveries. It is an important risk factor for perinatal mortality and morbidity. However, PPRM can be caused by pathologic mechanisms such as intra-amniotic infection and uterine overdistension, both of which have been widely observed in preterm gestational age. And another well-known risk factor is the history of PPRM in prior pregnancy. Additional risk factors are short cervical length, low body mass index (BMI), nutritional deficiency, cigarette smoking, and low socioeconomic status. Clinical factors associated with PPRM include low socioeconomic status, tobacco use, history of preterm labour, urinary tract infection, vaginal bleeding at any time in pregnancy, uterine distension (e.g. polyhydramnios, multifetal pregnancy), cerclage and amniocentesis. 2-4 The major maternal risks are chorioamnionitis (35%), abruption (19%) and sepsis (<1%). 3 Placental abruption is more common if membranes occur prior to 28 wk of gestation. 5 The risk of abruption increases 24 hr after membrane ruptures, particularly in the presence of intrauterine infection or oligohydramnios. Chorioamnionitis is also associated with gestational age at which PPRM occurs. Major fetal morbidity is pulmonary hypoplasia, RDS, sepsis, intraventricular hemorrhage and contractures. Pulmonary hypoplasia is frequent if PPRM occurs before 26 wk and the latency is prolonged for more than 5 wk. Latency, defined as the time from rupture of membranes till delivery has been described to be longer if PPRM occurs at an earlier gestational age. Oligohydramnios as a result of PPRM has been found to be associated with shorter latency and increased neonatal morbidity, but not associated with increased maternal or neonatal infections. Management schemes exist from one extreme to the other; some use

minimal testing to monitor maternal health only, whereas others suggest intensive and invasive plans that include cerclage with amnioinfusion, antibiotics, frequent fetal testing, and aggressive use of tocolytics and corticosteroids. Clearly, this diversity of approach suggests substantial controversy. Prediction of the latency period could help to lessen the controversy; for example, if latency was expected to be short, then the utility of tocolytics to gain time for corticosteroid administration might be greater. A few studies reported that a cervical length of <2 cm may be associated with a shorter latency to delivery. Prior studies found that a low (≤ 5 cm) amniotic fluid index (AFI) in PPRM is associated with a shorter latency and a higher rate of delivery within 7 days compared to women with a normal AFI. However, it is unclear how these two clinical variables can be used, either independently or in combination with CL, to help predict spontaneous preterm delivery in PPRM. Hence, the aim of this study was to assess the role of transvaginal sonographic measurement of cervical length and amniotic fluid index in women with PPRM between 28 to 34 weeks in predicting the delivery latency period.

CASE STUDY

This was a prospective observational study performed during July 2024 to July 2025 in the Department of Obstetrics and Gynecology, IMCHRC, Indore, 100 singleton pregnant women between 28 weeks to 34 weeks gestation with cephalic presentation and preterm premature rupture of membranes. All the women were subjected to ultrasound for determining AFI and cervical length and were followed up until delivery. Women with chorioamnionitis, multifetal pregnancy, antepartum haemorrhage, and women in labour were excluded from the study. Women were admitted in the ward and they were explained regarding the management protocol and consent was taken for inclusion in study. All the women after admission were subjected to detailed history and examination. Maternal parameters like parity, maternal age at the time of admission, gestational age at the time of presentation were noted. Basic investigations were done which includes haemoglobin, total leukocyte count, differential leukocyte count, C-reactive protein, urine routine microscopy and culture sensitivity, high vaginal swab. A sterile per speculum examination was done under all aseptic condition and presence of amniotic fluid coming out through cervical OS was confirmed. At the same sitting, high vaginal swab was taken for

culture sensitivity. Gestational age was calculated by last menstrual period or early trimester scan. Each of these admitted women were subjected to transabdominal ultrasound to calculate amniotic fluid index. Philips HD 11× E model ultrasound machine was used which had transabdominal probe of frequency 3-5 MHz and transvaginal probe of frequency 6-9MHz. Abdomen is divided into four compartment and each of the deep cord free vertical pocket of liquor is taken and sum up. Then after emptying, the bladder transvaginal ultrasound was done to measure cervical length. External cervical OS was identified as point at which anterior and posterior lips of cervix comes together. The point at which cervical mucosa ends is considered to be internal cervical OS. The cervix was occupying approximately 50 to 75% of image. At least three measurements were obtained and shortest length was taken. Cervical measurement is done by placing the callipers between external and internal cervical OS. All the admitted women were given expectant management, which includes antibiotics and

steroids. Latency for purpose of analysis was stratified into two groups ≤ 7 days and > 7 days. After delivery, perinatal outcome was assessed. A note was made of birth weight, Apgar score at 1 and 5 minutes, duration of NICU stay and perinatal mortality. Delivery latency period in this study was time interval between performing transvaginal scan to delivery of baby which is studied among women delivered spontaneously.

RESULT

Out of 100 women, 86 women who underwent spontaneous labor were included in the study. 41 women delivered within 7 days of the test, and 45 delivered afterwards. Out of 41 women, 29 (67.44%) had amniotic fluid index of ≤ 5 cm and 28 (65.12)% women had cervical length of ≤ 2 cm. The sensitivity, specificity, positive and negative predictive value of AFI alone in predicting delivery within 7 days were 72.14%, 64%, 67.22%, 70.15% respectively. The sensitivity, specificity, positive and negative predictive value of cervical length alone in predicting delivery within 7 days were 68%, 73%, 76% and 69% respectively. Out of 86 women, 30 had both the characteristics, (amniotic fluid index ≤ 5 cm and cervical length ≤ 2 cm), out of them, 22(75.86%) delivered with 7 days.

The sensitivity, specificity, positive and negative predictive value of combination of both in predicting delivery within 7 days were 73%,55%,77% and 49% respectively. The PPV of cervical length ≤ 2 cm and AFI ≤ 5 cm alone in predicting delivery within 7 days were 76% and 70.15%, whereas combination of both is 77%. For AFI > 5 the total number of women who had not delivered within 7 days were 36 out of which 29 women (80.56%) had CL of > 2 cm. The NPV of AFI > 5 cm and TVCL > 2 cm was 82%, means women with these two characteristics would remains undelivered within 7 days.

TABLE 1- VALIDITY OF CERVICAL LENGTH IN PREDICTING DELIVERY LATENCY PERIOD

MEAN +/- SD	DELIVERY LATENCY <7 DAYS	DELIVERY LATENCY >7 DAYS	P- value
Age/years (18-38)	28.95 +/- 7.02	28.02 +/- 6.34	0.52
Parity (0-5)	1.65 +/- 0.14	1.67+/-0.13	0.49
Gestational age/weeks (28-34)	31.16 +/- 2.34	31.02+/-2.25	0.77
Cervical length/cm	2.04 +/- 0.10	2.50+/-0.47	0.001
AFI/cm	4.73+/- 0.35	6.07+/-1.14	0.001

TABLE 2- VALIDITY OF CERVICAL LENGTH IN PREDICTING LATENCY PERIOD

CERVICAL LENGTH	<7 DAYS N	>7 DAYS N	P- value
< 2 cm	28	13	0.001
>2 cm	15	30	
Total	43	43	

TABLE 3: PREDICTION OF LATENCY PERIOD BY CERVICAL LENGTH

SENSITIVITY	68%
SPECIFICITY	73%
PPV	76%
NPV	69%
ACCURACY	71%

TABLE 4: VALIDITY OF AMNIOTIC FLUID INDEX IN PREDICTING DELIVERY LATENCY

USG – AFI	<7 DAYS	>7 DAYS	P- VALUE
< 5 CM	29	16	
>5 CM	14	27	0.001
TOTAL	43	43	

TABLE 5: PREDICTION OF DELIVERY LATENCY BY AMNIOTIC FLUID INDEX

SENSITIVITY	73%
SPECIFICITY	55%
PPV	77%
NPV	49%
ACCURACY	66%

TABLE 8: VALIDITY OF COMBINATION OF AFI>5CM AND CERVICAL LENGTH

CERVICAL LENGTH	<7 DAYS	>7 DAYS	P-VALUE
< 2 CM	4	7	0.0023
>2 CM	3	29	
TOTAL	7	36	

TABLE 9: PREDICTION OF DELIVERY LATENCY BY AFI>5 CM AND CERVICAL LENGTH > 2CM

SENSITIVITY	53%
SPECIFICITY	82%
PPV	51%
NPV	82%
ACCURACY	75%

CONCLUSION

Our study shows that there was an increase in PPV when we combine AFI and CL in prediction of time of labor, so women with AFI ≤ 5 and CL ≤ 2 had 77% risk of delivery within 7 days after PPROM. The NPV of AFI > 5 cm and TVCL > 2 cm was 82%, means women with these two characteristics would remains undelivered within 7 days. Furthermore, we found that there was no significant association between age, gestational age in weeks and parity with latency period for delivery.

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