

THE RELATIONSHIP OF AMNIOTIC FLUID INDEX AND CERVICAL LENGTH IN PREDICTION OF PRETERM LABOR IN PRETERM PREMATURE RUPTURE OF MEMBRANES CASES

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ABSTRACT

Background: Preterm premature rupture of membranes (PPROM) is a complication responsible for a third of preterm births. The prediction of time of labor complicated with PPRM is crucial for reducing maternal and neonatal complication. **Objective:** This study set out to determine whether transvaginal cervical length (TVCL), amniotic fluid index (AFI), or a combination of both can predict the time of labor within 7 days in women presenting with preterm premature rupture of membranes (PPROM). **Methods:** This was a prospective observational study carried out at Tishreen University Hospital in Lattakia-Syria during the period between (2022-2023). The study included 90 pregnant women with PPRM between 24–34 weeks. Cervical length and amniotic fluid index were measured in all women, with our primary outcome time of labor within 7 days of TVCL. **Results:** The study showed that the validity of CL alone in predicting labor when the cutoff value = 2 cm, the sensitivity = 54.76%, specificity = 64.58%, positive predictive value (PPV) = 57.5%, negative predictive value (NPV) = 62%, and accuracy = 60%. The validity of AFI alone when the cutoff value = 5 cm, the sensitivity = 71.42%, specificity = 54.16%, PPV = 57.60%, NPV = 68.42%, and accuracy = 62.22%. With a combination of CL and AFI in predicting time of labor after PPRM, the following results were found: sensitivity = 52.38%, specificity = 89.58%, PPV = 81.48%, NPV = 68.25%, and accuracy = 72.22%. **Conclusion:** The combination of the amniotic fluid index and the length of the cervix led to an increase in the specificity and positive predictive value in the prediction of time of labor. The study showed that women who have (AFI < 5cm, CL < 2cm) after preterm premature rupture of the membranes had an 81.48% risk of onset of labor within 7 days.

KEYWORDS: Expectant management, latency, perinatal outcome, prematurity, preterm labor, cervical length, amniotic fluid index, preterm premature rupture of membranes.

INTRODUCTION

Preterm premature rupture of membranes defines spontaneous rupture of the fetal membranes before 37 completed weeks and before labor onset. The incidence of PPRM is approximately 2-3% of all pregnancies, approximately half of patients deliver within a week, with the latent period of delivery related to the gestational age at PPRM. PPRM pathogenesis may be related to increased apoptosis of membrane cellular components and to increased levels of specific proteases in membranes and amniotic fluid. However, PPRM can be caused by 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 low body mass index (BMI), nutritional deficiency, cigarette smoking, and low socioeconomic status. This complication is responsible for one-third of preterm births and increases perinatal morbidity and mortality mainly because of the risk of intrauterine infection, which can lead to early neonatal infection, necrotizing enterocolitis and in utero fetal death. Additional complications are chorioamnionitis (15-20%), endometritis (15-20%) and immediate complications such as: umbilical cord prolapse in (1-2%), placental abruption in (2-5%), cord compression. Patients experiencing PPRM require clinical management in a hospital that provides the necessary care for premature newborns. Management of PPRM is based and consists of antibiotic prophylaxis and corticosteroids for fetal lung maturation. The main

monitoring objectives are the detection and management of maternal and fetal complications, in particular, intrauterine infection.

The prediction of time of labor could help direct the need for specific interventions such as hospitalization, intensive monitoring, timing of antenatal steroids, and magnesium for neuroprotection. Transvaginal ultrasound (TVU) for the determination of cervical length (CL) has been demonstrated to predict the risk of preterm delivery. The safety of serial TVU is consistently reported with no significant increase in endometritis, chorioamnionitis, or neonatal infection in women with PPRM. The aim of this study was to examine the relationship among CL, amniotic fluid volume, and time of labor in women presenting with PPRM.

METHODS

This was a prospective observational study carried out at Tishreen University Hospital in Lattakia-Syria during the period between (2022-2023).

The study included 90 pregnant women presented with PPRM between 24–34 weeks and matched the inclusion and exclusion criteria.

Inclusion criteria were as follows

1. Women who are not in labor.
2. Single pregnancy.
3. Evaluation within 24 hours after PPRM.
4. Gestational age is 24-34 weeks.

Exclusion criteria included

1. Inadequate diagnostic criteria for PPRM.
2. Presence of painful uterine contractions of more than 8 per hour, or cervical dilation of more than 3 cm.
3. Having a cervical cerclage.
4. Delayed evaluation more than 24 hours after PPRM.
5. Twin pregnancy.
6. Vaginal bleeding.
7. Signs of amniotic infection.
8. Fetal heart rate abnormalities
9. Patients with systemic diseases (diabetes mellitus, hypertension, ..).

First we explained the trial to the patient and we answered her questions.

Then, PPRM was diagnosed by history and physical examination, GA was calculated from the 1st day of the last normal menstrual period. All women were hospitalized and transabdominal ultrasound was performed to confirm the gestational age and calculate the amniotic fluid index.

Transvaginal ultrasound was performed within 24 hours of admission to measure cervical length using the CLEAR guidelines. Measurements of the TVCL were

taken after visualizing the endocervical canal in its entirety for 3-5 minutes, with an empty maternal bladder. Calipers were placed where the anterior and posterior walls of the cervix were sonographically opposed and the shortest technically best measurements were used.

Prophylactic antibiotics used included Ceftriaxone 1g intravenously every 12 h for 2 days, followed by oral amoxicillin 500 mg every 8 h for 5 days.

Betamethasone were given intramuscularly two doses of 12mg, 24 h apart. The vaginal examination was performed only when there was visible evidence of cervical changes through transvaginal ultrasonography. Monitoring the vital signs of the pregnant woman and the fetal heart rate once a day to follow up the fetal distress and imminence of labor. Perform NST twice weekly at least.

STATISTICAL ANALYSIS

All the statistical analysis was done using the(IBM SPSS statistics Version20). We used Chi-square test for categorical data and independent sample t-test for numerical data. For detection of cutoff value and to find sensitivity and specificity of test, we used receiver operator characteristic curve. The results were considered statistically significant with a p-value < 0.05.

RESULTS

This study was conducted on ninety women with PPRM. The mean age of women was 28.89 ± 5.3 years(range18–40 years). The parity ranged between 0 and 5. There were 42 women who started labor within 7 days of PPRM and 48 women who started labor after 7 days.

As shown in Table 1, there was no significant difference in age, parity, and GA, while there was a significant difference in AFI which is lower in those women delivered within 7 days.

Furthermore, there was a significant difference in CL which is less in women delivered within 7 days.

The area under the curve for AFI was 0.74 [Figure 1]. The validity of AFI in predicting time of labor in women with PPRM when the cutoff value was 5 is shown in Table 2.

The area under the curve for CL was 0.72 [Figure 2]. The validity of CL in predicting the time of labor in women with PPRM when the cutoff value was 2 is shown in Table 3.

Table 4 shows that there was an increase in specificity and positive predictive value (PPV) when we combine AFI and CL in prediction of time of labor.

Table 1: Demographics and maternal parameters by latency at 7 days.

	labor		P-value
	≤7 day	>7day	
Age/years	28.32±6.1	29.28±5.9	0.2
Parity (0-5)	3.43±2.1	3.37±2.4	0.5
GA/weeks	32.8±2.9	33.11±3.1	0.6
AFI	4.17±0.7	4.83±0.9	0.02
CL	1.81±0.5	2.39±0.8	0.04

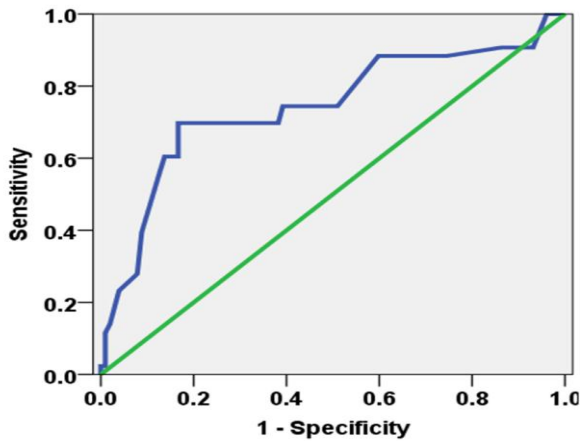


Figure 1: Receiver operating characteristic curve for amniotic fluid index.

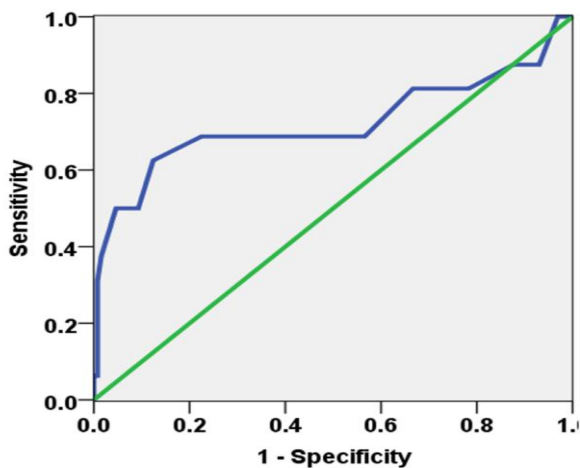


Table 2: Validity of amniotic fluid index in predicting time of labor after preterm premature rupture of membrane.

AFI	Labor		Total
	≤7 day	>7day	
≤5	30	22	52
>5	12	26	38
total	42	48	90

Sensitivity=71.42%, specificity=54.16%, PPV=57.69%, NPV=68.42%, accuracy=62.22%. PPV: Positive predictive value, NPV: Negative predictive value, AFI: Amniotic fluid index.

Table 3: Validity of cervical length in predicting time of labor among women with preterm premature rupture of membrane.

CL	Labor		Total
	≤7 day	>7day	
≤2	23	17	40
>2	19	31	50
Total	42	48	90

Sensitivity=54.76%, specificity=64.58%, PPV=57.5%, NPV=62%, accuracy=60%. PPV: Positive predictive value, NPV: Negative predictive value, AFI: Amniotic fluid index.

Table 4: Validity of cervical length and amniotic fluid index in predicting time of labor after preterm premature rupture of membrane.

AFI<5 + CL<2	Labor		Total
	≤7 day	>7day	
Positive	22	5	27
Negative	20	43	63
Total	42	48	90

Sensitivity=52.38%, specificity=89.58%, PPV=81.48%, NPV=68.25%, accuracy=72.22%. PPV: Positive predictive value, NPV: Negative predictive value.

DISCUSSION

The ability to predict the timing of labor is helpful to both the patient and physician. To better counsel our patients, we sought to determine whether CL and amniotic fluid volume would predict labor in a period of <7 days. Our study shows the validity of AFI in predicting time of labor in women with PPRM when cutoff = 5, and the validity of CL in predicting time of labor in women with PPRM when cutoff = 2.

Marion Rouziare et la showed that the factors predicting short latency were initial and persistent anamnios, short cervical length (< 25 mm) at admission, and the need for tocolysis between day 2 and day 7 of the expectant period. However the presence of oligohydramnios was not predictive of latency, but the existence of anamnios was associated with short latency.

Young-Joolee et la. found that the combination of cervical length with AFI and SDP can be useful in predicting delivery latency. However, it differed with our current study in determining the cut-off point for each of the variables, as the delivery latency was less than two days when (AFI≤7.72, SDP≤3.2, TVCL≤1.69).

This study sought to determine whether CL and AFI would independently predict latency in a period of less than 7 days and whether there is an increase in PPV if used in combination.

Our study showed that there was an increase in specificity and PPV when we combine AFI and CL in

prediction time of labor, so women with AFI ≤ 5 cm and CL ≤ 2 cm had 81.48% risk of started labor within 7 days after PPROM. This result was in agreement with the result of several authors.

CONCLUSION

The combination of the amniotic fluid index and cervical length led to an increase in the specificity and positive predictive value in predicting the timing of the onset of labor. The study showed that women who have (AFI < 5 cm, CL < 2 cm) after preterm premature rupture of the membranes had an 81.48% risk of onset of labor within 7 days.

Recommendation

It is recommended to measure cervical length and amniotic fluid index in all cases of preterm premature rupture of the membranes and to combine them to identify patients with a high risk of imminent delivery.

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