RESEARCH
O&G Forum 2024; 34-3s: 2985-2988

RELATIONSHIP OF AMNIOTIC FLUID INDEX AND CERVICAL LENGTH WITH DELIVERY LATENCY IN PATIENTS WITH PRETERM PREMATURE RUPTURE OF MEMBRANES IN OUR SETTINGS

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Take Home Message
Though there are other factors which provide more information in PPROM but in low income countries AFI and Cervical length which can be measured by simple ultrasonography can be used to predict PPROM and avoid maternal and fetal complications.

Abstract
Introduction:- Several research have shown that a cervical length of < 2 cm and low amniotic fluid index (AFI) of less than 5 cm may be associated with a shorter latency to delivery and a higher rate of delivery within 7 days. However, it is unclear how these two clinical variables can be used, either independently or in combination, to help predict spontaneous preterm delivery in Preterm Premature Rupture Of Membranes. The aim of this study was to assess the role of sonographic measurement of cervical length and amniotic fluid index in women with PPROM between 28 to 34 weeks in predicting the delivery latency period.
Materials and Methods
This study, conducted over a 1.5-year period, included 312 patients diagnosed with PPROM in a tertiary care hospital. The diagnosis was based on amniotic fluid leakage or sterile speculum examination. Patients were managed according to hospital protocol, with daily follow-up examinations for labor, infection, and wellbeing. The time of delivery was determined by individual circumstances, with induction of labor initiated or cesarean delivery performed when signs of infection or fetal distress were observed. The data was analyzed using SPSS Version 20.0.
Results:- Out of 312 patients 169 patients had latency period of less than 7 days and 143 patients had latency period of more or equal to 7 days. Most of patients with AFI <5 and/or CL <2 delivered within 7 days and most of patients with AFI ≥5 and/or CL ≥2 were having delivery latency ≥7 days. So delivery latency was directly related to amount of AFI and cervical length. Most of patients with POG <34 weeks delivered with delivery latency ≥7 days and most of patients with POG ≥34 weeks delivered with delivery latency <7 days. Amongst the babies who developed complications most of them babies were extreme preterm a. The complications seen in preterm infants in our setting were Respiratory distress syndrome, hypothermia, hypoglycemia, intra cranial hemorrhage, Apnea of prematurity, Necrotizing enterocolitis, sepsis and death. The survival and salvageblity of these preterm babies were dependent on their gestational age, birth weight and apgar score. Babies with late preterm gestation were having good birth weight and good apgar score were found less prone to these complications and vice versa.
Conclusion:- A shorter TVCL and lesser AFI independently predict delivery within 7 days in women presenting with PPROM. The combination of an AFI ≥5 cm and TVCL ≥2 cm greatly improved the potential to remain undelivered after 7 days and vice versa.
Keywords:- Amniotic fluid index, Cervical length, Delivery latency, Preterm premature rupture of membranes

INTRODUCTION

Preterm premature rupture of membrane (PPROM) is a spontaneous breach in the chorioamniotic membrane prior to the onset of labour at <37 weeks of gestation. [1,2] PPROM 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. The etiology of PPROM is multifactorial but infections play a significant role. [3] Prior to rupture of the membranes, there is probably a disruption of collagen synthesis at molecular level, a change in collagen structure or increased collagen degradation [4].

Amniotic fluid is crucial for the fetus' well-being, cushioning it from injury, preventing umbilical cord compression, and allowing growth. Its bacteriostatic action prevents intra-amniotic infection. Amniotic fluid volume is maintained within a narrow range due to water exchange between the mother, fetus, and placenta. Disorders in this process can result in polyhydramnios or oligohydramnios, with fetal urine output, pulmonary fluid production, and swallowing influencing fluid volume. [5] Best

investigation for measurement of amniotic fluid volume is ultrasonography, in which abdomen is divided arbitrarily into four quadrants (a,b,c, and d) and largest vertical pocket in each quadrant is measured in centimetres. Largest vertical pockets in all four quadrants are added to get Amniotic fluid index(AFI). Normal AFI is 5-24cms. The most sensitive method of measurement is single largest vertical pocket method. Normal value for single largest vertical pocket is 2-8cms [6].

Latency is the duration between rupture of membranes (ROM) and Delivery (this time frame can be hours, days or weeks). Latency is inversely correlated with the gestational age at ROM. The earlier the gestational age, the less likely labor will start at short notice after ROM. At term, the majority of women (90-95%) have delivered within 72 hours without an intervention to induce labor. Because of the risk of a short latency period, many neonates are born prematurely after PPROM. Therefore the risk of morbidity and disabilities later in life because of prematurity is high [7].

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 PPROM is associated with a shorter latency and a higher rate of delivery within 7 days compared to women with a normal AFI [7, 8].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 PPROM. Hence, the aim of this study was to assess the role of sonographic measurement of cervical length and amniotic fluid index in women with PPROM between 28 to 34 weeks in predicting the delivery latency period.

MATERIAL AND METHODS

This study was conducted over a period of one and a half year (Jan 2020 to June 2021) in a tertiary care hospital in our valley. This was a prospective observational study including 312 patients. All women diagnosed as PPROM during the said period were included in our study. The diagnosis of PPROM was established on the basis of a history suggesting amniotic fluid leakage or sterile speculum examination demonstrating either amniotic fluid passing through the cervix or fluid accumulation in the posterior vaginal fornix. The patients were managed accordingly as per the hospital protocol.

All base line investigations were done according to management protocol and two doses of 12 mg Injection Betamethasone was given 24 hrs apart. Sonographic assessment of cervical length and amniotic fluid level was done within 24 hrs of admission.

Routine daily follow-up examination was conducted for evidence of active labour, infection and wellbeing. Patients were monitored till they went into spontaneous labour or were induced at 34 completed weeks whichever was earlier and the outcome was recorded. The time of delivery was determined by individual circumstances. When signs of overt infection or active labour progression or non-reassuring of fetal well-being was observed, induction of labor was initiated or cesarean delivery was performed. However we followed with expectant management if the obvious signs of infection or fetal distress were absent.

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA) for analysis. A P-value of less than 0.05 was considered statistically significant.

RESULTS

Total number of patients included in our study was 312 aged from 20 years to 40 years. Out of 312 patients, 169 patients had latency period of less than 7 days and 143 patients had latency period of more or equal to 7 days. Amniotic fluid index (AFI) <5 was in 55 and ≥5 was in157 patients.

Out of 155 patients with AFI <5cms, delivery latency was <7 days in 102 patients and ≥7 days in 53 patients . Out of 312 patients, 125 patients had cervical length <2cms and 187 patients had cervical length ≥2cms. (Table 1).

Table 1. Distribution of patients

		Number	Percent
Delivery Latency	< 7 Days	169	54.2
	≥ 7 Days	143	45.8
Amniotic fluid index (AFI)	< 5	155	49.7
	≥ 5	157	50.3
Cervical length	< 2 cm	125	40.1
	≥ 2 cm	187	59.9

Our study analysed delivery latency with AFI, cervical length and gestational age. The AFI and cervical length had statistically significant relation (p Value <0.001) while the gestational age had statistically insignificant relation (p Value 0.035) with delivery latency as shown in Table 2.

Table 2: Relationship of delivery latency with AFI and cervical length (CL) among study patients

Parameter		DL < 7 Days		DL ≥ 7 Days		P-value
		No.	%age	No.	%age	
AFI	< 5	102	60.4	53	37.1	<0.001*
	> 5	67	39.6	90	62.9	
Cervical length	< 2	106	62.7	19	13.3	<0.001*
	> 2	63	37.3	124	86.7	
Gestational Age	< 34 Weeks	65	38.5	72	50.3	0.035*
	≥ 34 Weeks	104	61.5	71	49.7	

*Statistically Significant (P-value<0.05); P-value by Ch-square test

Among 312 patients admitted with PPROM, 104 patients were having both AFI<5cms and CL<2cms, 136 patients were having both AFI≥5cms and CL≥2cms. Out of 104 patients with both AFI<5cms and CL<2cms, 82 delivered within 7 days and 22 patients were having delivery latency more than 7 days while out of 136 patients with both AFI≥5cms and CL≥2cms, 51 delivered within 7 days and 85 patients were having delivery latency more than 7 days. (Table 3)

Table 3: Relationship of AFI and Cervical length with delivery latency among study patients

Delivery latency	AFI<5 & CL<2		AFI>5 & CL≥2		P-value
	No.	%age	No.	%age	
< 7 Days	82	78.8	51	37.5	<0.001*
≥ 7 Days	22	21.2	85	62.5	
Total	104	100	136	100	

*Statistically Significant (P-value<0.05); P-value by Chi-square test

Among 312 patients who were admitted with PPROM, 240 patients delivered during hospital stay. Out of 240 delivered patients 98 patients were 28-33+6weeks of gestation and 142 patients were of 34-36+6 weeks of gestation. Out of 98 patients with period of gestation 28-33+6weeks, 92 patients delivered vaginally and 06 patients delivered via cesarean section. Out of 142 patients with period of gestation 34-36+6 weeks, 100 patients delivered vaginally and 42 patients delivered via cesarean section. (Table 4).

Table 4: Route of delivery and period of gestation among study patients

Period of gestation	Vaginal delivery		Cesarean section		Total	
	No.	%age	No.	%age	No.	%age
28-33+6 Weeks	92	47.9	6	12.5	98	40.8
34-36+6 Weeks	100	52.1	42	87.5	142	59.2
Total	192	100	48	100	240	100

Amongst 98 delivered patients of gestation 28-33+6weeks, 56 patients delivered within 7 days of latency(46 with A/S <6/10 and 10 with
A/S≥6/10) and 42 patients delivered with delivery latency ≥ 7 days (20 with A/S <6/10 and 22 with A/S≥6/10). (Table. 5)

Table 5: Distribution of patients with 28-33^{+6} weeks of gestation with respect to DL and apgar score

Apgar score	DL < 7 Days		DL ≥ 7 Days		Total	
	No.	%age	No.	%age	No.	%age
< 6/10	46	82.1	20	47.6	66	67.3
≥ 6/10	10	17.9	22	52.4	32	32.7
Total	56	100	42	100	98	100

Amongst 142 delivered patients of gestation 34-36+6 weeks, 80 patients delivered within 7 days of latency(42 with A/S <6/10 and 38 with
A/S≥6/10) and 62 patients delivered with delivery latency ≥ 7 days (28 with A/S <6/10 and 34 with A/S≥6/10). (Table. 6)

Table 6: Distribution of patients with 33-36^{+6} weeks of gestation with respect to DL and apgar score

Apgar score	DL < 7 Days		DL ≥ 7 Days		Total	
	No.	%age	No.	%age	No.	%age
< 6/10	42	52.5	28	45.2	70	49.3
≥ 6/10	38	47.5	34	54.8	72	50.7
Total	80	100	62	100	142	100

Out of 240 patients who delivered during hospital stay in presence of a neonatologist, their babies were sent to NICU immediately for close observation and necessary treatment. Out of them, 194 babies developed complications and were admitted for more than a week in NICU while 46 babies were discharged uneventfully from NICU after an observation of at least 48 hours. Among 194 babies who developed complications 98 babies were extreme preterm and 96 babies were late preterm. The complications seen in preterm infants in our setting were Respiratory distress syndrome, hypothermia, hypoglycaemia, intra cranial hemorrhage, Apnea of prematurity, Necrotizing enterocilitis, sepsis and death. The survival and salvageblity of these preterm babies were dependent on their gestational age, birth weight and apgar score. Babies with late preterm gestation, good birth weight and good apgar score were found less prone to these complications and vice versa.

DISCUSSION

Our study was a prospective observational study including 312 patients with PPROM. Prediction of latency can be important, particularly when delivery in a hospital with tertiary level facilities is planned. Expectant management with antenatal antibiotic and corticosteroid administration are the recommended standard of care in the setting of PPROM at gestational age of ≤34 weeks.

In our study, 62.9% of patients with AFI ≥ 5 cm at all gestation ages had higher latency period and 65.8% of patients with AFI <5 cm at all gestation ages had latency period < 7 days. This finding was consistent with study of Taner Günay et al [9]. Megha Kansara et al [10] in their study observed that 73.91% delivered within 7 days who had amniotic fluid index of ≤5cm and For AFI > 5 the total number of women who had not delivered within 7 days were 33 out of which 28 women (84.85%) had CL of > 2 cm.

In our study 66.3% patients with cervical length ≥2cms had delivery latency ≥7 days and 84.8% patients with cervical length <2cms had delivery latency <7 days . The findings of our study that longer the cervix, more is the latency period, is consistent with the study of Megha Kansara et al [10] who observed The Positive predictive value of cervical length ≤ 2cm and AFI ≤ 5cm alone in predicting delivery within 7 days as 70.45% and 66.67%, whereas combination of both is 78.79%. According to Di Mascio et al [11] TVCL demonstrates a high level of accuracy in its ability to predict the occurrence of spontaneous labour in women who are at full term.

Most of the patients (52.5%) in our study with period of gestation <34 weeks had delivery latency ≥7 days and most of patients (59.4%) with POG >34 weeks had delivery latency<7 days. Most of patients (54.2%) in our study irrespective of POG who delivered within latency period of <7 days had fetal apgar score <6/10 and who delivered with latency period of ≥7 days had fetal apgar score ≥6/10 which is consistent with El Sokkary et al. [12] Patients with longer latency was having impact on fetal outcome in the form of 1st minute APGAR <7, NICU admission and neonatal morbidity which is consistent with the study of E. Baser et al [13]

Complications like Respiratory distress syndrome, Hypothermia, Hypoglycemia, Intra cranial hemorrhage, Apnea of prematurity, Necrotizing enterocolitis and Sepsis were observed in our study. In our study, the incidence of neonatal complications was high but comparable to that documented by Shams et al [14]. This high neonatal complication may be related more closely to the effects of premature birth and sophistication of New born special care unit.

CONCLUSION

A shorter TVCL and lesser AFI independently predict delivery within 7 days in women presenting with PPROM. The combination of an AFI ≥5 cm and TVCL ≥2 cm greatly improved the potential to remain undelivered after 7 days and vice versa. These findings may be helpful for counseling and optimizing maternal and neonatal care in women with PPROM.

Latency is inversely proportional to period of gestation which means lesser the period of gestation more will be the latency

period. Since the latency cannot be absolutely predicted in advance in pre-term pre-mature rupture of membranes, women with shorter cervix and lesser amniotic fluid index needs to be hospitalized and managed aggressively and should be monitored vigorously for further complications. The women with longer cervix and higher amniotic fluid may require a longer duration of antibiotic coverage since the latency period is more.

Compliance with Ethical Standards:
Conflict of Interest: All authors declare that none has any conflict of interest.
Ethical approval: All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.
Informed consent: Informed consent was obtained from all individual participants included in the study.

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