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Research Article

Association of Amniotic Fluid Index with Mode of Delivery and Fetomaternal Outcomes in Term Premature Rupture of Membranes (PROM)

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Abstract

Objective: To establish the relationship between amniotic fluid index (AFI) and mode of delivery and fetomaternal outcomes in term premature rupture of membranes (PROM).

Study Design: It was an analytical cross-sectional study.

Duration and Place of Study: This study was conducted at Hashim Medical City Hospital Hyderabad from February 2025 to February 2026.

Methods: In this study, 148 pregnant women with gestational age 37 to 40 weeks with PROM were included. Participants were divided into Group A (AFI ≥5 cm, n=90) and Group B (AFI <5 cm, n=58). Patients were observed to spontaneously labor or induced according to the Bishop score. During labor, maternal and fetal monitoring was carried out. Outcomes assessed included mode of delivery, induction success, indications for cesarean section, neonatal resuscitation, and complications. The data were analyzed with SPSS version 22, where $p<0.05$ was taken to be statistically significant.

Results: Vaginal delivery was significantly higher in Group A (n=58, 64.4%) compared to Group B (n=6, 10.3%), while cesarean section was more frequent in Group B (n=52, 89.7%) versus Group A (n=32, 35.6%) ($p<0.001$). Induction success rate was greater in Group A (n=17, 77.3%) than in Group B (n=5, 26.3) (p=0.004). The most common sign of cesarean in both groups was fetal distress. Group B (n=22, 37.9%) had higher neonatal resuscitation rates than Group A (n=10, 11.1%), p=0.021. Group B also had more neonatal complications and fewer neonates without complications (n=20, 34.5% vs. n=63, 70.0% respectively) (p=0.012).

Conclusion: Low AFI correlates with higher rates of cesarean section, unsuccessful induction, and negative neonatal outcomes in term PROM, thus its significance in clinical risk assessment and management planning.

Introduction

Premature rupture of membrane (PROM) at term, or spontaneous rupture of amniotic fluid before labor begins during a 37-week or longer pregnancy, is a frequent and clinically significant obstetric complication [1]. Once the protective membrane barrier is lost, the pregnancy is prone to progressive infection, cord compression, labor anomalies, and fetal compromise, and maternal infectious morbidity may also be increased by delayed delivery [2]. Studies continue to indicate that management decision-making, even in the term PROM, is affected by the risk of infection, fetal distress, and the necessity of induction or operative birth, but not only by the integrity of membranes [2, 3]. The term PROM leads to complications in about 8% of pregnancies across the world [1]. Pakistan hospital-collected data have reported that PROM is a frequent obstetric presentation, with 4.67% of deliveries having it [4].

Amniotic fluid index (AFI) is a clinical variable that may be used to narrow the prognosis of PROM, as it is a quick sonographic evaluation of the remaining fluid after membrane rupture [5]. A reduction in the volume of amniotic fluid may signify a prolonged leakage and reduced cushioning around the fetus that may cause cord compression, abnormal fetal heart rate rhythm, meconium-stained liquor, failed induction, and resultant caesarean delivery [5, 6]. Oligohydramnios is typically defined as an AFI of ≤5 cm, and recent literature continues to indicate that low AFI is associated with increased obstetric interventions and worse neonatal outcomes, including increased incidences of fetal distress and NICU hospitalization [4, 6]. Practically, AFI may be helpful as the test is inexpensive and highly accessible and may also be part of the routine screening of women presenting with term PROM, particularly in low-resource hospitals where other types of fetal surveillance may not always be feasible [5, 7].

Recent research has supported the argument that AFI is not an ordinary descriptive ultrasound finding but can have a considerable effect on PROM [5]. In a prospective study of women with term PROM, those with oligohydramnios (AFI <5 cm) had a much higher rate of labor induction, cesarean delivery, and maternal and neonatal complications than women with AFI >5 cm. Fetal distress was the primary indication in both groups, especially in women with oligohydramnios, and 86% of the low-AFI group and 50% of the higher-AFI group had cesarean deliveries [7]. Maternal complications such as chorioamnionitis and puerperal sepsis, along with neonatal problems including respiratory distress, pneumonia, and sepsis, were also more frequent when AFI was low [7].

Optimizing treatment techniques in term PROM patients requires an awareness of the relationship between AFI and delivery mode, particularly the difference between induced and spontaneous labor, given the clinical implications [8]. The present study was therefore conducted to evaluate the impact of AFI on the mode of delivery and fetomaternal outcomes in women presenting with term PROM.

Methodology

The sample size of this cross-sectional analytical study was 148. In this study, pregnant women with a gestational age of 37-40 weeks and who had PROM were recruited. Women who became pregnant as a singleton, who received a confirmed PROM at 12 hours after the membrane rupture, and who did not experience any uterine

contractions at the time of admission were included. In addition, all participants had documented AFI at admission and provided informed consent. The study did not include women with a long PROM (12 hours or more), those who had already entered active labor at presentation, multiple pregnancies, or non-cephalic presentations to enhance homogeneity of the sample. The institutional review board approved the study, and everyone agreed to participate.

All participants received a baseline clinical evaluation upon admission to eliminate the presence of active labor. The patients were followed through to 24 hours until they spontaneously labor. Close attention was paid to the maternal and fetal well-being over this time. Mother's vital signs (temperature and pulse), uterine tenderness, and fetal heart rate were measured at regular intervals (every 4 hours) to detect early signs of infection or fetal distress. When spontaneous labor took place during the observation period, it was dealt with according to normal obstetric interventions.

Cervical status was applied to induce labor when there was no labor initiation within 24 hours, and the fetus had no indication of infection or distress. Women who had a positive cervix (Bishop score ≥6) received an oxytocin infusion; women with an unfavorable cervix (Bishop score <6) received oral misoprostol, and, in some cases, oxytocin. The birth, either through induction or cesarean section, was done immediately in front of clinical evidence of chorioamnionitis or fetal distress.

Cardiotocography was carried out continuously during labor, supplemented by non-stress testing and regular clinical examinations. Appropriate laboratory tests, including complete blood count and C-reactive protein, were performed when needed. The major outcomes measured were mode of delivery, onset of labor (spontaneous or induced), evidence of cesarean section, and pertinent fetomaternal complications.

The study was carried out using SPSS version 22, where categorical variables were shown as frequencies and percentages and continuous variables as mean and standard deviation. A p-value of less than 0.05 was regarded as statistically significant, and appropriate statistical procedures, such as the chi-square test and Student's t-test, were used.

Results

The study included 148 participants, with 90 in Group A (AFI ≥5 cm) and 58 in Group B (AFI <5 cm). Most women were aged 20–30 years in both groups (Group A: n=54, 60.0%; Group B: n=35, 60.3%), with similar mean ages (29.3±5.1 vs 29.4±5.0 years). The majority had BMI 25–27.9 (Group A: n=71, 78.9%; Group B: n=44, 75.9%), with no significant difference (p=0.82). Urban residents predominated (Group A: n=62, 68.9%; Group B: n=39, 67.2%) (Table 1).

Table 1: Demographic and Clinical Characteristics of Study Population (n=148)

Variable	Category	Group A n=90	Group B n=58	Total (n=148)	p-value
Age Group (years)	20-30	54 (60.0%)	35 (60.3%)	89 (60.1%)	-
	31-40	36 (40.0%)	23 (39.7%)	59 (39.9%)	-
Mean Age (years)	—	29.3 ± 5.1	29.4 ± 5.0	—	-
BMI (kg/m²)	25-27.9	71 (78.9%)	44 (75.9%)	115 (77.7%)	
	22-24.9	10 (11.1%)	8 (13.8%)	18 (12.2%)	

	28–31.0	9 (10.0%)	6 (10.3%)	15 (10.1%)	0.82
Residence	Urban	62 (68.9%)	39 (67.2%)	101 (68.2%)	-
	Rural	28 (31.1%)	19 (32.8%)	47 (31.8%)	-

Mode of delivery differed significantly between groups, where Group A (normal AFI) and Group B (low AFI) showed contrasting outcomes. Vaginal delivery was more frequent in Group A (n=58, 64.4%) compared to Group B (n=6, 10.3%), while cesarean section was higher in Group B (n=52, 89.7%) than Group A (n=32, 35.6%). Induction was performed in 41 patients (n=41, 27.7%), with higher success in Group A (n=17, 77.3%) versus Group B (n=5, 26.3%). Failed induction was more common in Group B (n=14, 73.7%) (Table 2).

Table 2: Association of Amniotic Fluid Index with Mode of Delivery and Induction Outcomes

Variable	Category	Group A n=90	Group B n=58	Total (n=148)	p-value
Mode of Delivery	Vaginal delivery	58 (64.4%)	6 (10.3%)	64 (43.2%)	<0.001
	Cesarean section	32 (35.6%)	52 (89.7%)	84 (56.8%)	0.003
Induction Outcomes	Patients undergoing induction	22 (24.4%)	19 (32.8%)	41 (27.7%)	-
	Successful vaginal delivery after induction	17 (77.3%)	5 (26.3%)	22 (53.7%)	0.004
	Failed induction	5 (22.7%)	14 (73.7%)	19 (46.3%)	-

The most frequent indication for cesarean births in both groups was fetal distress, which was more prevalent in Group A (n = 25, 78.1%) than in Group B (n = 34, 65.4%). Induction/NPOL failure was more common in Group B (n = 14, 26.9%) than in Group A (n = 5, 15.6%). Chorioamnionitis was relatively uncommon in both groups (Table 3).

Table 3: Distribution of Indications for Cesarean Delivery in Relation to Amniotic Fluid Index (n=84)

Indication	Group A n=32	Group B n=52	p-value
Fetal distress	25 (78.1%)	34 (65.4%)	-
Failure of induction / non-progress of labor (NPOL)	5 (15.6%)	14 (26.9%)	0.003
Chorioamnionitis	2 (6.3%)	4 (7.7%)	-

Neonatal resuscitation was required more frequently in Group B (n=22, 37.9%) compared to Group A (n=10, 11.1%). Most neonates in Group A did not require resuscitation (n=80, 88.9%), indicating better neonatal outcomes with normal AFI (Table 4).

Table 4: Association of Amniotic Fluid Index with Neonatal Resuscitation Requirement (n=148)

Neonatal Outcome	Group A n=90	Group B n=58	p-value
No resuscitation required	80 (88.9%)	36 (62.1%)	-
Required resuscitation	10 (11.1%)	22 (37.9%)	0.021

Neonatal complications were more frequent in Group B (low AFI), with fewer neonates having no complications (n=20, 34.5%) compared to Group A (normal AFI) (n=63, 70.0%). Group B showed significantly more respiratory distress, pneumonia, and sepsis, which signaled worse neonatal outcomes with poor AFI (Table 5).

Table 5: Distribution of Neonatal Complications in Relation to AFI

Neonatal Outcome	Group A) n=90	Group B n=58	p-value
Respiratory distress syndrome	10 (11.1%)	14 (24.1%)	
Pneumonia	7 (7.8%)	10 (17.2%)	
Neonatal sepsis	5 (5.6%)	7 (12.1%)	
Hypoglycemia	3 (3.3%)	5 (8.6%)	
Other complications	2 (2.2%)	2 (3.5%)	
No complications	63 (70.0%)	20 (34.5%)	0.012

Discussion

The purpose of this research was to determine if, in women who arrive with term PROM, AFI at admission affects the manner of delivery and fetomaternal e outcome. The mode of delivery and AFI were shown to be significantly correlated in women who presented with term PROM. In our data, low AFI was strongly associated with cesarean delivery, while normal AFI was linked with a much higher vaginal birth rate. This trend is similar to an Eastern Indian study

conducted by Dutta et al., which found that idiopathic oligohydramnios at term was correlated with greater obstetric intervention and higher rates of cesarean section [5]. A separate study by Khan et al. revealed that, in term PROM, low AFI also correlated with increased cesarean births and decreased spontaneous deliveries [7].

Induction was successful much more frequently in the normal AFI group compared to the failed induction in the low AFI group in the present study. Bellussi et al. suggested that immediate induction in term PROM tends to improve both maternal and neonatal outcomes without increasing the risk of cesarean delivery overall [9]. Similarly, a systematic review found that active management is a popular choice in modern practice [10]. Conversely, in the study by Whelan et al. about complicated pregnancies with oligohydramnios, the majority of the women who experienced pregnancy had spontaneous vaginal birth despite the manner of induction used, which is in contrast with the very poor induction performance observed in our low-AFI PROM group [11]. This is probably because our population faced the additional stressor of membrane rupture, which can increase cord compression, fetal labor intolerance, and clinician worry. Conversely, Yang et al. reported that low-dose oral misoprostol combined with oxytocin yielded delivery outcomes similar to those with PROM at 36 weeks or later, suggesting that the risk could be influenced by cervical health status and induction regimen, despite the presence of PROM [12].

Fetal distress was the most prevalent factor in both groups in our study when it came to indications that a cesarean birth should be performed, and the low-AFI group was more likely to have failed induction or non-progress of labor. This trend is biologically feasible and supported by a case study of borderline oligohydramnios at term,

where cesarean section became more common because of fetal distress [13]. In Sohail et al.'s study, fetal distress was also the leading cause of cesarean delivery, with poor progress of labor [14]. Meanwhile, the recent evidence is not all pointing in the same direction. Khanjani et al. proposed that extending expectancy management to a 24-hour period could decrease cesarean deliveries in a cohort of women without causing any meaningful additional complications [15]. The finding contrasts with the high operative burden observed in our low-AFI group and indicates a significant difference.

We found that the low-AFI group experienced a significantly higher frequency of resuscitation and burden of pneumonia, sepsis, and respiratory distress syndrome, and the normal-AFI group experienced a higher probability of being complication-free. This trend is consistent with recent findings that indicate that reduced amniotic fluid in PROM or term oligohydramnios indicates a less stable intrauterine environment, probably due to cord compression, reduced placental reserve, and increased vulnerability to intrapartum and early neonatal compromise [5, 7]. Meanwhile, there is a certain contrast to be observed. Patel et al. found that oligohydramnios at term was strongly correlated with neonatal morbidity [16], whereas a Pakistani study by Khattak et al. reported low Apgar scores in 17% of term pregnancies complicated by oligohydramnios, and 8% of term pregnancies resulting in NICU hospitalization [17]. Based on our results, it appears that neonates who are born beyond term PROM but have low AFI would benefit from greater vigilant preparation of the delivery room. In addition, admission AFI might assist obstetric teams in recognizing PROM cases that require enhanced fetal

monitoring and earlier pediatric intervention before overt compromise manifests [18].

There are some limitations to this study. The study was carried out at a single tertiary care facility and had a limited sample size, which might restrict how broadly the findings can be applied. AFI was measured only at admission and not followed up, which limits the possibility of test-retest changes. Moreover, no assessment of long-term neonatal outcomes was conducted.

Conclusion

This study reveals that amniotic fluid index at admission plays a significant role as a predictor of delivery outcomes in term PROM. Low AFI was linked to an increased cesarean delivery, failed induction, and a poor neonatal outcome, such as resuscitation and complications. Conversely, normal AFI was associated with better maternal and neonatal outcomes. The results demonstrate the clinical importance of AFI as a convenient and useful risk-stratification and management-planning instrument among women with term PROM. More extensive multicenter studies with long-term follow-up are required to strengthen the evidence and inform clinical practice in PROM management.

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