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# Amniotic Fluid Index and its Impact on Mode of Delivery and Fetomaternal Outcome in Term PROM

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**Abstract**

***Background:*** *The increasing prevalence of term premature rupture of membranes (PROM) poses significant challenges to obstetrical management, necessitating enhanced predictive methodologies for optimal clinical outcomes.*

***Objectives: Primary Objective:*** *To evaluate the association between amniotic fluid index (AFI) and mode of delivery, as well as fetomaternal outcomes, in pregnant women at term with PROM.*

***Specific Objectives:*** *To assess the association between AFI values at admission and the mode of delivery (vaginal vs. cesarean) in Term PROM cases.*

- *To determine whether low AFI (AFI < 5 cm) is a predictive marker for induction failure and higher cesarean delivery rates.*
- *To explore potential indications for cesarean delivery in relation to AFI status, including fetal distress and failed induction.*

***Materials and Methods:*** *This analytical cross-sectional study was conducted at Dhaka Medical College, Bangladesh, from August 2019 to February 2020. A total of 126 pregnant women with confirmed term PROM (37–40 weeks) were enrolled. Inclusion criteria were singleton cephalic pregnancies with adequate pelvis; exclusions included preterm PROM, previous uterine surgery, non-cephalic presentation, intrauterine growth restriction (IUGR), and maternal hypertensive or diabetic disorders. AFI was measured by ultrasound and patients were grouped as Group A (AFI e" 5 cm) and Group B (AFI < 5 cm). After PROM confirmation, patients were monitored for spontaneous labor for 24 hours; if labor did not begin, induction was performed based on cervical status. Outcomes included mode of delivery and fetomaternal complications. Data were analyzed using SPSS version 22 with chi-square tests for categorical variables; p < 0.05 was considered significant.*

***Results:*** *Among 126 term PROM cases, 76 had AFI e" 5 cm (Group A) and 50 had AFI < 5 cm (Group B). Vaginal delivery occurred in 50 women in Group A (65.8%), of which 26 had spontaneous onset of labor and 14 required induction. In Group B, only 5 women (10%) delivered vaginally, with 1 spontaneous and 4 induced labors. Cesarean section rates were significantly higher in Group B (90.0%) compared to Group A (34.2%) (p = 0.002), primarily due to fetal distress and failed induction. Induction outcomes showed that successful vaginal delivery after induction was 77.8% in Group A versus 25% in Group B (p = 0.003). Neonates in Group B had increased need for resuscitation (38.0% vs. 10.5%, p = 0.02) and higher rates of complications including pneumonia, respiratory distress syndrome, neonatal sepsis, hypoglycemia, and other complications. The proportion of neonates without complications was significantly lower in Group B (34.0%) compared to Group A (71.1%) (p = 0.01).*

***Keywords:*** *Amniotic fluid index, mode of delivery, term PROM.*

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## Introduction

Assessment of the amniotic fluid index (AFI) is a vital component of third-trimester antenatal ultrasound evaluations, providing insight into fetal well-being and guiding obstetric management. Deviations from the normal range, particularly oligohydramnios (AFI < 5 cm), have been associated with increased perinatal morbidity, including fetal distress, meconium aspiration, intrauterine growth restriction, and a higher incidence of operative deliveries[1,2].

In pregnancies complicated by term premature rupture of membranes (PROM), AFI measurement at admission offers prognostic value in anticipating delivery outcomes. Several studies have demonstrated that women with normal AFI levels are more likely to undergo spontaneous labor and achieve vaginal delivery, while those with reduced AFI frequently require labor induction and are at increased risk of cesarean section due to non-reassuring fetal status or failed induction[3,4].

The mode of delivery following PROM is influenced not only by cervical readiness and infection risk but also by the amniotic fluid environment. Oligohydramnios may increase the likelihood of labor interventions, compromise fetal tolerance of contractions, and heighten the risk of emergency cesarean sections [5]. Moreover, fetuses from low-AFI pregnancies are more susceptible to neonatal complications such as respiratory distress syndrome, sepsis, and the need for resuscitation[6,7].

Given the clinical implications, understanding the association between AFI and delivery mode—including the distinction between spontaneous and induced labor—is essential for optimizing management strategies in term PROM cases. This study aims to evaluate the correlation between AFI and the mode of delivery, onset of labor, and fetomaternal outcomes, as well as to examine the major indications for cesarean section across different AFI categories.

## Methodology

### Study Setting and Population:

This analytical cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Dhaka Medical College, Bangladesh, over six months from August 2019 to February 2020. Pregnant women with a gestational age of 37 to 40 weeks presenting with PROM were selected after fulfilling inclusion and exclusion criteria.

### Inclusion Criteria:

- Pregnant women with singleton gestation at term (e”37 to d”40 weeks).
- Cephalic presentation.
- Confirmed diagnosis of premature rupture of membranes (PROM) within 12 hours of membrane rupture.
- No uterine contractions at the time of admission.
- Availability of amniotic fluid index (AFI) measurement on admission.
- Willingness to provide informed consent and comply with study procedures.

Exclusion Criteria:

- Prolonged PROM (membrane rupture >12 hours before admission).
- Women already in active labor upon presentation.
- Multiple gestations.
- Non-cephalic presentation.

### Study Procedure:

Admission ensured participants were not in active labor and presented within 12 hours of PROM. PROM diagnosis was confirmed by sterile speculum examination and clinical history.

After admission and PROM confirmation, patients were monitored up to 24 hours for spontaneous labor. Maternal temperature, pulse, uterine tenderness, and fetal heart rate were checked every 4 hours to assess for chorioamnionitis or fetal compromise.

- If labor began spontaneously, patients proceeded to delivery per standard obstetric protocols.
- If labor did not initiate within 24 hours and no infection or fetal distress was present:
  - Bishop score e” 6: oxytocin infusion initiated.
  - Bishop score < 6: oral misoprostol followed by oxytocin as required.
- Immediate induction or cesarean delivery was performed if infection developed (fever e” 38°C, uterine tenderness, foul-smelling discharge, maternal or fetal tachycardia).

### Outcome Measures:

- Mode of delivery: vaginal or cesarean.
- Spontaneous vs induced labor.

- Indications for cesarean: fetal distress, chorioamnionitis, failed induction.
- Fetomaternal complications.

Maternal and fetal monitoring was conducted throughout labor, including continuous fetal heart rate monitoring (cardiotocography), periodic non-stress tests (NST), and regular clinical assessment for signs of chorioamnionitis (maternal fever, uterine tenderness, tachycardia, leukocytosis). Laboratory investigations such as complete blood count (CBC) and C-reactive protein (CRP) levels were performed as needed.

**Statistical Analysis:**

Data were analyzed using SPSS version 22. Continuous data were expressed as mean, standard deviation, minimum, and maximum. Categorical data were summarized as frequency counts and percentages. Chi-square test was used for comparison of categorical variables, and Student's t-test was applied for continuous variables. A two-sided p-value of <0.05 was considered statistically significant.

**Ethical Considerations:**

Ethical approval was granted by the local ethics committee. Participants were informed about the study's purpose and procedures, and confidentiality was maintained. Written consent was obtained from all participants.

**Results**

The age distribution between groups was similar, with the majority in the 20-30 years range. There was no statistically significant difference in mean age between the groups.

Table shows 79% of the Group A population belonged to the BMI range of 25-27.9 4and 76% from Group B. P value =0.87 showing nosignificant difference between the two groups.

Table shows that maximum numbers of respondents came from urban area (68.3%), followed by rural area (31.7%).

There was a significant association between AFI and mode of delivery. Vaginal delivery was markedly more frequent in the normal AFI group, while cesarean section was more common among those with low AFI.

Women with normal AFI had significantly higher successful vaginal delivery rates after induction compared to those with low AFI. Failed induction was significantly more common in the low AFI group.

Fetal distress was the leading indication for cesarean delivery in both groups. Failure of induction was significantly more frequent in the low AFI group, suggesting compromised labor progression in oligohydramnios cases.

Neonates from the low AFI group experienced higher rates of pneumonia, respiratory distress syndrome, neonatal sepsis, hypoglycemia, and other complications. The proportion of neonates without complications was significantly lower in Group B.

**Table-I**

*Age Distribution of the Study Population (n=126)*

| Age Group | Group A (AFI ≥5 cm) | Group B (AFI < 5 cm) | Total | P value |
|---|---|---|---|---|
| 20 to 30 years | 46 (60.5%) | 30 (60%) | 76 (60.3%) | - |
| 31 to 40 years | 30 (39.5%) | 20 (40%) | 50 (39.7%) | - |
| Total | 76 (100%) | 50 (100%) | 126 (100%) | - |
| Mean age | 29.1 ± 5.2 years | 29.2 ± 5.2 years | - | - |

**Table-II**

*Distribution of cases according to BMI*

| BMI | Group A(AFI>5cm) n=76 | Group B(AFI<5cm) n=50 | p value |
|---|---|---|---|
| 22-24.9 | 8 (10.5%) | 7 (14%) | |
| 25-27.9 | 60 (79%) | 38 (76%) | |
| 28-30.9 | 8 (10.5%) | 5 (10%) | 0.84 |

**Table-III**

*Distribution of cases according to residence (n=126)*

| Residence | Frequency | Percentage |
|---|---|---|
| Urban | 86 | 68.3% |
| Rural | 40 | 31.7% |
| Total | 126 | *100.0%* |

**Table-IV**

*Association Between Amniotic Fluid Index (AFI) and Mode of Delivery (n=126)*

| Mode of Delivery | Group A (AFI ≥5 cm) (n=76) | Group B (AFI < 5 cm) (n=50) | Total (n=126) | P value |
|---|---|---|---|---|
| Vaginal Delivery | 50 (65.8%) | 5 (10.0%) | 55 (43.7%) | <0.001 |
| Cesarean Section | 26 (34.2%) | 45 (90.0%) | 71 (56.3%) | 0.002 |

**Table-V**

*Association Between AFI and Induction Outcomes*

| Induction Result | Group A (AFI ≥5 cm) (n=76) | Group B (AFI < 5 cm) (n=50) | P value |
|---|---|---|---|
| Patients undergoing induction | 18 (23.7%) | 16 (32.0%) | - |
| Successful vaginal delivery after induction | 14 (77.8%) | 4 (25.0%) | 0.003 |
| Failed induction | 4 (22.2%) | 12 (75.0%) | - |

**Table-VI**

*Indications for Cesarean Section (n=71)*

| Indication | Group A (AFI ≥5 cm) (n=26) | Group B (AFI < 5 cm) (n=45) | P value |
|---|---|---|---|
| Failure of induction / Non-progress of labor (NPOL) | 4 (15.4%) | 12 (26.7%) | 0.002 |
| Fetal distress | 21 (80.7%) | 30 (66.7%) | - |
| Chorioamnionitis | 1 (3.9%) | 3 (6.6%) | - |

**Table-VII**

*Neonatal Resuscitation Requirement by AFI*

| Indication | Group A (AFI ≥5 cm) (n=76) | Group B (AFI < 5 cm) (n=50) | P value |
|---|---|---|---|
| Required resuscitation | 8 (10.5%) | 19 (38.0%) | 0.02 |
| No resuscitation | 68 (89.5%) | 31 (62.0%) | - |

Neonates from mothers with low AFI required resuscitation significantly more often, indicating increased neonatal risk.

**Table-VIII**

*Neonatal Complications by AFI Group*

| Complication | Group A (AFI ≥5 cm) (n=76) | Group B (AFI <5 cm) (n=50) | P value |
|---|---|---|---|
| Pneumonia | 6 (7.9%) | 9 (18.0%) | — |
| Respiratory distress syndrome | 8 (10.5%) | 12 (24.0%) | — |
| Neonatal sepsis | 4 (5.3%) | 6 (12.0%) | — |
| Hypoglycemia | 3 (3.9%) | 4 (8.0%) | — |
| Other complications | 1 (1.3%) | 2 (4.0%) | — |
| No complications | 54 (71.1%) | 17 (34.0%) | 0.01 |

## Discussion

This study demonstrated a significant association between amniotic fluid index (AFI) and mode of delivery among women with term premature rupture of membranes (PROM). Women with normal AFI (≥5 cm) showed a notably higher rate of vaginal delivery (65.8%) compared to those with low AFI (<5 cm), where cesarean delivery was predominant (90%). These findings are consistent with previous studies by Alchalabi et al. (2021) and Chate et al. (2020), who reported increased cesarean rates in oligohydramnios due to fetal distress and failed induction[13,14].

Analysis of induction outcomes revealed that successful vaginal delivery following induction was significantly more frequent in women with normal AFI (77.8%) than in those with low AFI (25%). Conversely, failed induction rates were substantially higher in the low AFI group (75% vs. 22.2%, p=0.003). These results suggest that oligohydramnios may impair labor progression and uterine response to induction agents, aligning with findings reported by Bhagat and Chawla (2020)[15].

The primary indications for cesarean section were fetal distress and failure of induction/non-progress of labor. While fetal distress was the most common indication in both groups, failure of induction was significantly more frequent in the low AFI group (26.7% vs. 15.4%, p=0.002). This highlights the increased risk of labor complications in pregnancies complicated by oligohydramnios.

Neonatal outcomes were adversely affected in the low AFI group. The need for resuscitation was significantly higher (38.0% vs. 10.5%, p=0.02), and rates of pneumonia, respiratory distress syndrome, neonatal sepsis, and hypoglycemia were elevated compared to the normal AFI group. Notably, only 34% of neonates in the low AFI group were free of complications, compared to 71.1% in the normal AFI group (p=0.01). These findings corroborate the increased neonatal morbidity associated with oligohydramnios as reported in prior studies[6,7].

Overall, AFI measurement at admission in term PROM provides valuable prognostic information for mode of delivery, induction success, and neonatal outcomes. Women with oligohydramnios require closer monitoring and may benefit from individualized delivery planning, given their higher likelihood of cesarean delivery and neonatal complications.

## Limitations

This study was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability of findings. AFI was assessed only once at admission without serial monitoring, potentially missing dynamic changes. Additionally, cervical length and Bishop scores were not uniformly documented for labor progression correlation. Long-term neonatal outcomes were not assessed. Future multicenter studies with larger cohorts and comprehensive perinatal follow-up are recommended to validate these findings and establish evidence-based protocols for PROM management.

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