



Role of Admission Test in Predicting Foetal Outcome in Prelabour Rupture of Membranes

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ABSTRACT:

Background:

A serious obstetric disorder linked to higher neonatal morbidity and mortality is prelabour rupture of membranes (PROM). Optimizing results, especially in preterm PROM (PPROM), requires early detection of fetal impairment. A quick, non-invasive way to evaluate fetal health is through the Admission Test, a straightforward type of fetal surveillance performed at hospital admission.

Objective:

To evaluate the role of the Admission Test in predicting fetal outcomes in pregnancies complicated by PROM.

Methods:

The pathophysiology and categorization of PROM, the justification for fetal monitoring, and the structure and elements of the Admission Test are all examined in this study. It compares the test to other monitoring methods, looks at its predictive power, and considers its significance in clinical decision-making. There is also discussion of fetal monitoring's shortcomings, difficulties, and prospects.

Conclusion:

An efficient screening method for determining fetal status in PROM is the Admission Test. It supports prompt clinical judgments about the use of corticosteroids or antibiotics, as well as birth planning. Even though it isn't conclusive, its predictability and accessibility make it an important part of PROM management, particularly in environments with few resources. Its therapeutic impact and diagnostic accuracy could be further enhanced by integration with cutting-edge monitoring technology.

1.Introduction:

The spontaneous rupture of the fetal membranes prior to the commencement of labor, regardless of gestational age, is known as prelabour rupture of membranes (PROM). Preterm PROM (PPROM) is the term used when this happens before 37 full weeks, whereas term

PROM is used at or after 37 weeks. PROM has a major impact on perinatal morbidity and death, complicating roughly 8–10% of all term pregnancies and 2-4 percent of preterm pregnancies [1,2]. Particularly in cases of PPRM, PROM is linked to severe neonatal outcomes such respiratory distress



syndrome (RDS), sepsis, and intraventricular hemorrhage, as well as an increased risk of intrauterine infections, abruptio placentae, and umbilical cord prolapse [3].

Importance of Fetal Monitoring in PROM

In order to manage PROM, it is essential to promptly and accurately examine the fetal wellness because this information informs decisions on the time and method of delivery. In addition to raising the possibility of ascending infections and perhaps changing placental perfusion, membrane rupture jeopardizes the protective amniotic environment. If not identified in time, these variables may cause fetal hypoxia or distress, which may have detrimental postnatal consequences[4]. To improve newborn outcomes, fetal monitoring assists clinicians in identifying early indicators of compromise so that prompt therapies, such as labor induction, cesarean birth, or the administration of corticosteroids and antibiotics, can be started. For fetal surveillance upon hospital admission, admission tests are a quick, easy, and non-invasive method, particularly when PROM is present [5].

Concept and Components of the Admission Test

A type of initial fetal surveillance known as the admission test is carried out when a pregnant woman is brought to a labor and delivery facility, especially in high-risk obstetric circumstances like PROM. Its objective is to evaluate the fetal heart rate (FHR) patterns prior to the start of active labor in order to identify fetuses that are susceptible to hypoxia during labor. Reactive FHR patterns in response to fetal movements are used to assess fetal health in the non-stress test (NST), which is regarded as a modified version of this test [6].

Components of the Admission Test include:

1. **Non-Stress Test (NST):** A 20–40 minute cardiotocography (CTG) monitoring of the fetal heart rate that focuses on:
 - Baseline fetal heart rate
 - Variability
 - Accelerations (presence and frequency)
 - Absence of decelerations

2. **Fetal Movements:** If the mother perceives at least three fetal movements during the test period, the fetus is likely to be neurologically healthy and oxygenated [7].

3. **Amniotic Fluid Assessment (if included):** An ultrasound assessment of the amniotic fluid index (AFI) may be performed to detect oligohydramnios, which is particularly pertinent in situations with PROM, even though it is not necessarily a direct component of the admission test.

Positive fetal outcomes are linked to a reactive admission test (normal NST with good variability and accelerations), whereas a non-reactive test can suggest fetal compromise and call for an early delivery or more testing [8]. The admittance test is especially helpful in busy labor wards and environments with limited resources because of its ease of use and non-invasiveness. In PROM, when infection and fluid loss may affect fetal health, it is crucial to interpret the data in the context of therapeutic practice.

2.Pathophysiology and Classification of PROM

Preterm PROM (PPROM) vs Term PROM

Regardless of gestational age, prelabour rupture of membranes (PROM) is the term used to describe the spontaneous rupture of the chorion and amniotic sac before to the start of labor contractions. Based on the gestational age at rupture, PROM is further categorized as follows:

Preterm PROM (PPROM) occurs prior to 37 weeks of gestation, while term PROM occurs at 37 weeks or later [9].

Because of the problems of prematurity and the possibility of intrauterine infections, PPRM offers serious dangers to both the mother and the fetus, whereas term PROM is reasonably frequent and often linked with positive results if managed effectively [10].

Risk Factors for PROM

Multiple maternal, fetal, and environmental factors are implicated in the pathogenesis of PROM. These include:

- **Infections:** Subclinical intra-amniotic infections, especially bacterial vaginosis, are strongly associated with PROM [11].



- **Cervical insufficiency** or history of cervical procedures (e.g., cone biopsy, LEEP)
- **Multiple gestation**
- **Polyhydramnios** and **macrosomia**, which increase intrauterine pressure
- **Previous history of PROM or preterm birth**
- **Smoking and low body mass index**
- **Antepartum bleeding**
- **Connective tissue disorders** such as Ehlers-Danlos syndrome (collagen defects impair membrane strength) [12]

Maternal and Fetal Implications of PROM

Maternal Implications

- **Infection:** The most serious risk to mothers is chorioamnionitis, an intra-amniotic bacterial infection that, if left untreated, can lead to maternal sepsis or postpartum endometritis [13].
- **Placental Abruption:** Premature placental separation and uteroplacental ischemia can result from fluid loss.
- **More surgical procedures:** Cesarean sections may become more common if the fetal condition is unsatisfactory.

Fetal Implications

- **Preterm birth:** As gestational age decreases, the risk of infant morbidity and mortality increases, especially in PPRM.
- **Neonatal sepsis:** As a result of an infection that ascends.
- **Pulmonary hypoplasia:** Prolonged oligohydramnios hinders lung development in extreme preterm PROM (<24 weeks).
- **Umbilical cord complications:** Complications with the umbilical chord, such as prolapse and compression, which can cause hypoxia and fetal distress [14].

Table 1: Maternal & Fetal Complications in PROM

Complication	Incidence (%)	Reference
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Chorioamnionitis (Maternal)	10–20%	Kenyon S et al.,
Placental Abruption	5–10%	Kenyon S et al.,
Neonatal Sepsis	15–25%	Kenyon S et al.,
Respiratory Distress Syndrome (RDS)	20–30%	Kenyon S et al.,
Pulmonary Hypoplasia (<24 wks PPRM)	<5%	Kenyon S et al.,

Mechanisms Affecting Fetal Wellbeing in PROM

The fetal membranes' integrity is essential for shielding the developing embryo from harm. When membranes burst, this barrier of defense is compromised, leading to:

- **Amniotic fluid loss:** Amniotic fluid permits healthy fetal mobility and lung development in addition to providing mechanical cushioning. In preterm fetuses, oligohydramnios after PROM may result in pulmonary hypoplasia, fetal discomfort, and constriction of the umbilical cord [15].
- **Enhanced risk of intrauterine infection:** As the membranes burst, bacteria climbing from the vagina enter the sterile intrauterine environment. The fetus is then susceptible to problems like as pneumonia and early-onset sepsis.
- **Increased inflammation:** Fetal inflammatory response syndrome (FIRS), which is linked to long-term consequences such cerebral palsy and bronchopulmonary dysplasia, can be brought on by inflammatory mediators released during infection or rupture [16].
- **Modified uteroplacental perfusion:** Non-reassuring fetal heart rhythms on admission testing may indicate intermittent fetal hypoxia and impaired placental blood flow caused by cord compression and decreased fluid [17].

3.Fetal Surveillance in PROM

Fetal surveillance is essential for identifying fetal impairment early and directing prompt action in cases of



prelabour rupture of membranes (PROM). Fetal heart rate (FHR) patterns in response to fetal movements are assessed by the Non-Stress Test (NST); fetal breathing, movements, tone, and amniotic fluid volume are assessed by ultrasound using the Biophysical Profile (BPP), which combines NST with Doppler velocimetry, especially of the umbilical artery, to determine placental resistance and fetal oxygenation status [18,19].

One quick, non-invasive screening method to find fetuses at risk is the Admission Test, a brief NST administered at hospital admission. It is particularly helpful in cases of PROM where the health of the fetus may be jeopardized by fluid loss, infection, or cord compression. While a non-reactive pattern calls for additional testing or intervention, a reactive test indicates healthy fetal status [20].

4.Components of the Admission Test

Non-stress testing (NST) is the main method used in the admission exam to assess the fetal heart rate's (FHR) variability and sensitivity to fetal movements. At least two accelerations of ≥ 15 beats/min lasting ≥ 15 seconds within 20 minutes are considered reactive NSTs, which indicate healthy fetal autonomic function and sufficient oxygenation [21]. NST can identify early indicators of fetal distress in PROM, such as infection or compression of the cord. In order to identify oligohydramnios, a common finding in PROM due to fluid loss that may lead to cord compression and hypoxia, amniotic fluid assessment—often done by bedside ultrasound—is crucial [22].

Fetal neurological integrity and oxygenation are reflected in the measurement of fetal movement, which can be done electronically or by the mother [23]. Key measurements include baseline FHR and variability: a reassuring fetal status is indicated by a normal baseline (110–160 bpm) with substantial variability (6–25 bpm), while fetal impairment may be indicated by nonexistent or little variability [24].

Table 2: Components of Admission Test and Clinical Interpretation

Component	Normal Interpretation	Reference
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Baseline FHR (110–160 bpm)	Reassuring	Krishna U et al.,
Variability (6–25 bpm)	Good Autonomic Function	Freeman RK et al.,
Accelerations ≥ 15 bpm (≥ 15 sec)	Adequate Oxygenation	Freeman RK et al.,
Absence of Decelerations	No Hypoxia	Freeman RK et al.,
Fetal Movements ≥ 3 in 20 min	Neurologically Intact	Freeman RK et al.,

5. Methodology of Admission Test

When a pregnant woman enters the labor ward, particularly in high-risk situations like PROM, the entrance test is performed. External cardiotocography (CTG) is used to record uterine activity and FHR during the test, which usually lasts 20 to 40 minutes. To avoid vena caval compression, it is recommended that the woman lie in a semi-recumbent position [25]. A baseline FHR of 110–160 bpm, significant variability, and at least two accelerations without decelerations in 20 minutes are all indicative of a reactive pattern [26]. Fetal hypoxia or acidosis may be indicated by a non-reactive pattern, which lacks accelerations or exhibits nonexistent or minimal variability or recurring decelerations [27].

Medication, maternal fever, and gestational age must all be taken into account during interpretation. Additional tests, such as a biophysical profile or Doppler examinations, can be necessary to validate fetal health in cases with non-reactive results [28].

6. Predictive Value of Admission Test in PROM

In PROM patients, the admission test has demonstrated efficacy in predicting fetal deterioration. Results that are non-reactive or aberrant often indicate intrapartum fetal discomfort, which leads to an accelerated birth. Since unsatisfactory admission test results frequently indicate fetal hypoxia or infection, several studies have found that cesarean deliveries are more common after these tests. Adverse newborn outcomes, such as poor Apgar scores, NICU hospitalization, and a higher risk of neonatal



infection, are also linked to these disorders. In PROM, the test assists in identifying high-risk fetuses prior to the onset of labor, enabling clinicians to take preventative measures. The admittance test is still a valuable screening tool that aids in clinical judgment and outcome prediction in PROM cases, despite its drawbacks [29].

Table 3: Predictive Values of Admission Test in PROM

Admission Test Result	Neonatal Morbidity (%)	Cesarean Section Rate (%)	Reference
Reactive	5%	15%	Arulkumaran S et al.,
Non-Reactive	30%	45%	Shalak LF et al.,

7. Clinical Decision-Making Based on Admission Test Results

An essential component of obstetric decision-making in PROM is the admission test. Particularly in cases of term PROM or stable preterm PROM, a reactive test encourages ongoing monitoring and expectant care. A non-reactive test, on the other hand, calls for more testing and might suggest an immediate delivery, particularly if there are indications of infection or fetal distress. Reactive testing in PPRM prolongs gestation while guaranteeing fetal monitoring by allowing time for the administration of corticosteroids and antibiotics. In order to avoid negative outcomes, non-reactive results may necessitate a cesarean section or labor induction. As a result, the admission test serves as a triage tool that affects the degree of fetal observation, the use of adjunct medications, and the timing of delivery [30].

8. Comparative Studies and Evidence Review

The entrance test has been compared to other fetal surveillance techniques, including as Doppler investigations and the biophysical profile (BPP). The admission test has a moderate sensitivity and specificity for forecasting unfavorable outcomes, but it is faster and easier to administer, particularly in busy labor units. Although it takes more time and money, BPP offers a more thorough evaluation. Although it is not always

utilized in PROM instances, Doppler velocimetry is especially helpful in cases of growth restriction or premature fetuses. Even though the entrance test is straightforward, it has demonstrated a strong association with fetal acidemia and poor neonatal outcomes when it is non-reactive. As a result, it continues to be a useful first screening tool, particularly in environments with limited resources, directing the need for more assessment [31].

9. Limitations and Challenges

The entrance test has drawbacks despite its widespread use. Unnecessary procedures may come from false-positive results caused by transitory fetal sleep cycles, maternal medicines, or inadequate tracing. In a similar vein, failing to detect occasional fetal distress could result in false negatives. Inter-observer variability also affects how CTG tracings are interpreted, with variations in clinical judgment impacting results. Fetal heart rate responsiveness and variability may be inherently lower in preterm PROM, making interpretation more challenging. These elements reinforce the admission test's function as a screening tool rather than a conclusive diagnostic one and emphasize the necessity of using it carefully. It guarantees greater accuracy and minimizes needless obstetric procedures when combined with clinical indicators and other fetal examinations [32].

10. Future Perspectives

Future developments in fetal monitoring could improve admission testing's usefulness and precision. Subjectivity and inter-observer variability could be decreased by automating and standardizing CTG interpretation through advancements in machine learning and artificial intelligence (AI). Real-time remote fetal monitoring may be possible with continuous wireless monitoring and telemedicine-based surveillance, which is particularly advantageous in remote or low-resource environments. Additionally, studies that combine the results of admission tests with biochemical indicators of fetal infection or hypoxia could improve risk prediction. In order to lower perinatal morbidity and enhance clinical outcomes in PROM and other high-risk diseases, these technologies seek to provide earlier, more precise diagnosis of fetal impairment [33].



11. Conclusion

For fetal assessment in PROM instances, the entrance test is still a useful, easy, and affordable method. It offers instant insights on the health of the fetus, assisting clinicians in making decisions about additional monitoring, treatment, or delivery. A non-reactive test calls for immediate care or closer examination, while a reactive test indicates fetal stability. Even with its drawbacks, when utilized properly, the admission test greatly lowers perinatal morbidity and mortality. Its accuracy and clinical significance may be improved by future integration with cutting-edge monitoring methods and AI-driven interpretation. It had a well-established position as a frontline screening approach in PROM till then, especially in situations where time-sensitive judgments are crucial and resources are scarce.

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