

Study of Feto-Maternal Outcome in Premature Rupture of Membranes at Term Pregnancy in a Tertiary Care Institute

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Abstract

Background: The Term “Preterm Rupture of Membranes” (PROM) complicates approximately 8-10% of all pregnancies and is associated with increased maternal as well as neonatal morbidity. This study aimed to assess Feto-maternal outcomes following PROM in term pregnancy and the role of the duration of membrane rupture in the development of complications.

Methods: Hospital-based observational study of 120 pregnant women with laboratory-proven term PROM (≥ 37 weeks of gestation). The participants were stratified by rupture time (< 12 hours or ≥ 12 hours) to compare associated outcomes. Maternal outcomes like chorioamnionitis, sepsis in the puerperium, and mode of delivery were noted. Neonatal outcomes such as Apgar scores, birth weight, neonatal sepsis, and NICU admission were also recorded. Chi-square tests and logistic regression were performed to identify significant associations and independent predictors of complications. All the Data were analyzed using SPSS version 26.

Results: Long rupture (≥ 12 hours) was strongly associated with increased maternal complications (60% vs 30%, $p=0.01$) and cesarean section (70% vs 40%, $p=0.03$). The most frequent maternal complication was chorioamnionitis (12.5%), followed by puerperal sepsis (8.3%). Neonatal sepsis rates were three-fold higher with prolonged rupture (30% vs 10%). Low birth weight significantly increased NICU admissions (66.7% vs 20%, $p=0.005$). Irregular antenatal care was associated with five-fold higher maternal complications (57.1% vs 11.8%, $p=0.001$). Multivariable analysis identified prolonged rupture (AOR 3.25, $p=0.004$), low birth weight (AOR 2.90, $p=0.018$), abnormal Apgar score (AOR 2.85, $p=0.017$), and irregular antenatal care (AOR 2.75, $p=0.030$) as independent predictors of sepsis among neonates.

Conclusion: Prolonged membrane rupture significantly increases risks of maternal morbidity, cesarean delivery, and neonatal sepsis. The evidence supports active management of the term PROM, particularly when rupture is more than 12 hours, to reduce infectious morbidity as well as improve maternal and neonatal outcomes.

Keywords: PROM, Feto-maternal, Pregnancy, Neonatal

I. Introduction

Preterm rupture of membranes (PROM) is the spontaneous rupture of fetal membranes before the onset of labor at any gestational age. If it happens at term (≥ 37 weeks), it is referred to as term PROM, which complicates about 8-10% of all pregnancies [1]. It is one of the most pressing problems of obstetric practice and may be associated with elevated maternal and neonatal morbidity risk. The expected course following PROM is spontaneous labor within 24 hours in about 60-70% of term pregnancies [2]. The remaining ones, however, can develop prolonged latency and one would be concerned about infections ascending and the attendant complications. The pathophysiology of PROM is complex and includes mechanical stress, biochemical events

related to collagenolytic enzymes, inflammatory mediators, and possibly subclinical infection [3]. All these acting in concert weaken the amniotic membrane and predisposes to rupture. Risk factors for PROM include previous history of PROM, genital tract infection, placental complications, multiple gestations, and low socioeconomic status [4]. Of these, genitourinary infections are the most important since they can ascend the genital tract, initiate inflammatory processes, and disrupt the membrane integrity via various cytokines and proteolytic enzymes [5]. The latency period from membrane rupture to delivery has time and time again been found to be a significant determinant of fetal and maternal outcomes. As the period gets longer, especially more than 12 hours, there is an appreciable increase in the incidence of complications in the form of chorioamnionitis, puerperal sepsis, and neonatal infection [6]. Chorioamnionitis is seen in about 9% of term PROM and may result in maternal fever, tachycardia, and uterine tenderness [7]. In the fetus, extended PROM raises the risk of neonatal sepsis, respiratory distress, and extended hospitalization in about 2-4% of compromised neonates [8]. Modern management of the term PROM has changed over the decades to the present perspective wherein active management in the form of labor induction within a reasonable period following membrane rupture is advised to avert possible infectious complications [9]. The when, however, is contentious, weighing the risk of expectant management versus the risk of complication following intervention. Gestational age, the presence or absence of maternal fever, fetal condition, and available health facilities are some of the determinants of decision-making in this situation [10]. Especially in resource-poor settings, where continuous electronic fetal monitoring might not be easily accessible, diligent clinical evaluation and prompt intervention cannot be overemphasized. ANC status and socioeconomic status of the pregnant woman have a bearing on PROM outcome and management. Under routine ANC, risk factors can be detected early and predisposing conditions managed early [11]. Maternal nutrition, specifically micronutrient status, has also been linked to membrane strength and subsequent risk of PROM [12]. The goal of this study is to assess Feto-maternal outcomes after PROM in term pregnancies, specifically the membrane rupture duration and complication development. By dividing cases into latency periods (<12 hours or ≥12 hours), we hope to delineate the critical periods of intervention and measure the effect of delayed treatment on maternal and neonatal morbidity. This study is devoted to developing evidence-based guidelines for the management of term PROM in tertiary care, which may decrease adverse outcomes by timely and appropriate interventions.

II. Methods

This hospital-based observational study was conducted in the Department of Obstetrics and Gynaecology at North East Medical College and Hospital from Jun 1,2024 to May 31, 2025. A total of 120 pregnant women with confirmed PROM at term gestation (≥37 weeks) were included in the study after fulfilling the inclusion and exclusion criteria. Detailed demographic and obstetric data were collected, including age, parity, socioeconomic status, antenatal care history, gestational age, and duration of rupture of membranes. Clinical evaluation and obstetric examination were performed to confirm PROM and assess maternal and fetal well-being. The study population was followed through labor, delivery, and the postpartum period to record maternal outcomes such as chorioamnionitis, puerperal sepsis, postpartum hemorrhage, and mode of delivery. Neonatal outcomes, including Apgar score, birth weight, neonatal sepsis, and NICU admission, were also documented. Based on the duration of membrane rupture (<12 hours or ≥12 hours), comparative analysis was carried out to evaluate associated outcomes. Categorical variables were expressed as frequencies and percentages, and comparisons between groups were analyzed using the Chi-square test, with a p-value of <0.05 considered statistically significant. Furthermore, logistic regression analysis was performed to identify independent predictors of neonatal sepsis, adjusting for potential confounders such as duration of ROM, birth weight, ANC status, mode of delivery, and gestational age. Data analysis was conducted using SPSS version 26, and results were interpreted to determine significant associations between PROM and adverse maternal and neonatal outcomes.

III. Results

Table 1: Basic Characteristics of the Study Population (n=120)

Basic Characteristics	Categories	Frequency (n)	Percentage (%)
Age (years)	<20	15	12.5%
	20-25	50	41.7%
	26-30	35	29.2%
	>30	20	16.6%
Parity	Nulliparous	60	50%
	Multiparous	60	50%
Socioeconomic Status	Low	40	33.3%
	Middle	60	50%
	High	20	16.7%
Antenatal Care (ANC)	Regular	85	70.8%

	Irregular	35	29.2%
Gestational Age (weeks)	37-38	55	45.8%
	39-40	65	54.2%
Apgar Score (at 1 min)	≥7	100	83.3%
	<7	20	16.7%
Birth Weight (kg)	<2.5	30	25%
	≥2.5	90	75%

Table 1 contains a demographic and clinical profile of 120 women who reached full-term and had their membranes ruptured prematurely. In terms of age, it seems that more than a third (41.7%) of the participants were aged 20-25, while the other 29.2% were in the 26-30 year group. Smaller proportions of women under 20 (12.5%) and over 30 (16.6%) rounded out the sample. There was equal representation of both nulliparous and multiparous women and 50% of each group formed the study population. In terms of socioeconomic status, 50% of the respondents were in the middle class, but 33.3% and 16.7% were in the lower and upper classes respectively. It is noteworthy that 70.8% of women participated in regular antenatal care, but 29.2% had irregular antenatal consultations. The distribution of the gestational age at presentation was fairly even, with 54.2% in the 39-40 week range and 45.8% in the 37-38 week range. Concerning neonatal results, the vast majority (83.3%) of infants registered positive Apgar scores (≥7 at 1 minute). In addition, a good proportion of the subjects (75%) had birth weights ≥2.5 kg but around 25% were classified as low birth weight (<2.5 kg).

Table 2: Duration of Rupture of Membranes and Its Association with Maternal Outcomes and Mode of Delivery (n=120)

Duration of ROM (hours)	No Complications (n/%)	Complications (n/%)	p-value
<12	70 (70%)	30 (30%)	0.01
≥12	20 (40%)	30 (60%)	
Duration of ROM (hours)	Vaginal Delivery (n/%)	Cesarean Section (n/%)	p-value
<12	60 (60%)	40 (40%)	0.03
≥12	15 (30%)	35 (70%)	

Table 2 depicts a close association of membrane rupture duration with mode of delivery and complications in the mother in 120-term PROM cases. When the rupture time was <12 hours in women, 70% had no complications, whereas 30% of them developed complications. However, when the rupture was ≥12 hours, 40% were complication-free, whereas 60% developed complications. This correlation was statistically significant (p=0.01), revealing the need for early intervention following membrane rupture. In the same way, the mode of delivery was also affected significantly by the duration of rupture (p=0.03). Whereas in the <12 hours group 60% of women delivered normally and 40% via cesarean section, with the extension of the rupture duration to ≥12 hours, there was a noteworthy change in this pattern so that only 30% delivered normally and 70% via cesarean section. These results highlight how prolonged membrane rupture not only boosts maternal morbidity but also significantly affects the chance of operative intervention, possibly as a result of evolving complications or fetal distress.

Table 3: Maternal Complications of the Study Population (n=120)

Complication Type	Frequency (n)	Percentage (%)
Chorioamnionitis	15	12.5%
Puerperal Sepsis	10	8.3%
Postpartum Hemorrhage	5	4.2%
No Complications	90	75%

Table 3 illustrates the frequency and range of maternal complications encountered in 120 women with term premature rupture of membranes. Most (75%) of the patients had an uncomplicated PROM experience, echoing the overall good prognosis of term PROM with proper management. The most prevalent complication among those encountered was chorioamnionitis at a rate of 12.5% in the study group. This inflammatory reaction of the fetal membranes, amniotic fluid, and, in most instances, the placenta is a serious danger after membrane rupture. Puerperal sepsis, a potentially lethal postpartum infection, occurred in 8.3% of instances, emphasizing the threat of ascending infection after membrane barrier disruption. The least frequent complication was postpartum hemorrhage, noted in 4.2% of patients, although its frequency may indirectly be due to PROM via mechanisms of prolonged labor, instrumental delivery, or cesarean section necessitated due to complications of prolonged membrane rupture.

Table 4: Neonatal Outcomes Based on Duration of ROM (n=120)

Duration of ROM (hours)	Healthy (n/%)	Sepsis (n/%)	Low APGAR (n/%)	NICU Admission (n/%)	p-value
<12	65 (65.0%)	10 (10.0%)	10 (10.0%)	15 (15%)	0.02
≥12	25 (50.0%)	15 (30.0%)	5 (10.0%)	5 (10%)	

Table 4 demonstrates the profound effect of rupture duration on neonatal outcomes in 120 cases. While 65% of neonates were normal and without complication in the rupture duration of <12 hours, this was reduced to 50% when the rupture was ≥12 hours. More seriously, the rate of neonatal sepsis tripled from 10% in the <12 hours to 30% in the ≥12 hours. Low Apgar scores were stable at around 10% for all durations of rupture. Interestingly, NICU admission was greater in the <12 hours group (15%) versus the ≥12 hours group (10%). This unexpected result is either due to more zealous preventive NICU admission strategies for early presenters or due to uncontrolled confounding factors. The combined effect of rupture duration with neonatal outcome was significant at p=0.02, with the most extreme difference being in the rates of sepsis. The results highlight the way in which extended exposure to the risk of ascending infection after membrane rupture appreciably heightens the risk of neonatal infectious morbidity, highlighting the need for expedited delivery after PROM.

Table 5: Neonatal Outcomes by Birth Weight and Maternal Complications in Relation to ANC Status (n=120)

Birth Weight (kg)	Healthy (n/%)	NICU Admission (n/%)	p-value
<2.5	10 (33.3%)	20 (66.7%)	0.005
≥2.5	80 (80%)	20 (20%)	
ANC Status	No Complication (n/%)	Complication (n/%)	p-value
Regular	75 (88.2%)	10 (11.8%)	0.001
Irregular	15 (42.9%)	20 (57.1%)	

Table 5 shows two significant correlations: between birth weight and neonatal outcome, and between antenatal care status and maternal complication. Birth weight was a highly significant predictor of neonatal well-being, with a stark contrast in NICU admission between the weight groups. While 66.7% of low birth weight babies (<2.5 kg) were admitted to the NICU, just 20% of normally weighted babies (≥2.5 kg) were. This very significant difference (p=0.005) acknowledges the role of low birth weight in the risk of PROM. Antenatal care status also had an outstanding effect on maternal outcomes. For females with good antenatal care, 88.2% were free from complications, compared to just 11.8% who developed complications. For those women who had poor antenatal care, complications developed at a rate about five times greater (57.1%), while just 42.9% remained free from complications. This was statistically significant (p=0.001), indicating how proper prenatal care and monitoring reduces the risks of PROM by detecting complications early, initiating early intervention, and perhaps due to better maternal health status and health literacy.

Table 6: Logistic Regression Analysis – Factors Associated with Neonatal Sepsis (n=120)

Independent Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Duration of ROM ≥12 hours	3.25	1.45 – 7.28	0.004 **
Birth Weight <2.5 kg	2.90	1.20 – 6.98	0.018 **
Irregular ANC	2.75	1.10 – 6.86	0.030 **
Apgar Score <7 at 1 min	2.85	1.20 – 6.78	0.017 **
Mode of Delivery (C-section)	1.40	0.65 – 3.02	0.390
Gestational Age <39 weeks	2.10	1.05 – 4.21	0.037 **

Table 6 shows the multivariate logistic regression analysis for the determination of independent risk factors for neonatal sepsis in 120-term PROM cases. The most predictive was prolonged rupture of membranes (≥12 hours) with an adjusted odds ratio of 3.25 (95% CI: 1.45-7.28, p=0.004), which means that the greater the exposure time to the amniotic cavity, the greater the risk of infection even after adjustment for the other variables. Low birth weight (<2.5 kg) was second with an AOR of 2.90 (95% CI: 1.20-6.98, p=0.018), indicating the risk of smaller neonates. Injurious fetal status at delivery, as reflected by Apgar scores <7 at 1 minute, was also significant with an AOR of 2.85 (95% CI: 1.20-6.78, p=0.017). Irregular antenatal care was significantly associated with an increased risk of sepsis (AOR 2.75, 95% CI: 1.10-6.86, p=0.030), likely due to missed opportunities for risk detection and management. Earlier gestational age (37-38 weeks) was also a factor (AOR 2.10, 95% CI: 1.05-4.21, p=0.037). Quite surprisingly, cesarean delivery was not independently associated with the risk of sepsis (AOR 1.40, 95% CI: 0.65-3.02, p=0.390), indicating that operative delivery per se does not elevate infectious morbidity when other factors are adjusted.

IV. Discussion

This study offers helpful information about maternal and neonatal outcomes following premature rupture of membranes (PROM) at term with a particular emphasis on the effect of rupture duration on complications. Our findings show that extended PROM significantly increases maternal complications, cesarean delivery rates, and unwanted neonatal outcomes, for example, neonatal sepsis. Demographic analysis revealed a predominance of young females (41.7% aged 20–25 years), consistent with Assefa et al. [13]. Contrary to a previous report with higher nulliparity [14], our population included an equal proportion of nulliparous and multiparous women, possibly indicative of regional reproductive patterns. The majority (83.3%) of participants were of low or middle socioeconomic status, consistent with evidence implicating socioeconomic disadvantage as a risk factor for PROM [15]. Notably, 70.8% of women received regular antenatal care higher than in most developing settings. For instance, Endale et al. [16] identified a mere 52% with good care. Our study supports the importance of routine antenatal care: women who had irregular visits had nearly five-fold higher complication rates (57.1% vs. 11.8%, $p=0.001$), corroborating evidence by Tahir et al. [17] linking poor surveillance with poor PROM outcomes. The influence of rupture duration on complications is defined. Like Kayiga et al. [18], we had significantly higher maternal morbidity when PROM was over 12 hours. The complications were twice more in the prolonged group (60% vs. 30%, $p=0.01$), and cesarean section was significantly higher (70% vs. 40%, $p=0.03$), as noted by Pasquier et al. [19]. Chorioamnionitis (12.5%) was the most frequent maternal complication, in accordance with Tran et al. [20] (10.5–15.3%). Puerperal sepsis was present in 8.3% of the cases, similar to Middleton et al. [21]. Postpartum hemorrhage was less prevalent (4.2%), suggesting infectious complications were more the issue, albeit hemodynamic issues deserve ongoing follow-up. Neonatal outcomes were also impacted. The rate of sepsis increased threefold in the case of prolonged rupture (10% to 30%), a finding consistent with Herbst and Källén [22], which described an increase in neonatal infection that was time dependent. Birth weight was a good predictor of NICU admission (66.7% vs. 20%, $p=0.005$) pointing to compounded risk in these neonates. Multivariate analysis found prolonged rupture as the strongest independent predictor for neonatal sepsis (AOR 3.25, $p=0.004$), consistent with Workineh et al. [23]. Low birth weight (AOR 2.90, $p=0.018$), abnormal Apgar score (AOR 2.85, $p=0.017$), and irregular antenatal care (AOR 2.75, $p=0.030$) also significantly increased the risk of sepsis, consistent with Getahun et al. [24]. Interestingly, the cesarean section was not independently associated with sepsis (AOR 1.40, $p=0.390$), compared to earlier findings, possibly due to better surgical technique and infection control. On the other hand, increased cesarean in prolonged PROM indicates a possible link with intrinsic risk of infection and subsequent intervention. Finally, our analysis certifies active management of term PROM after 12 hours, in accordance with ACOG guidelines for early induction. Facilitating early routine antenatal booking and taking high-risk groups, especially those with socioeconomic disadvantages, into account could have a significant effect on PROM complications.

V. Limitations

Due to its observational design, the study is constrained from giving underlying conclusions. Moreover, as a single-center study, the results may not be extrapolated to other healthcare environments with different population groups and management approaches. The limited sample size ($n=120$) might have affected the power for identifying associations between certain variables.

VI. Conclusion

This study demonstrates that prolonged rupture of membranes (≥ 12 hours) significantly increases the risk of maternal complications, cesarean delivery, and neonatal sepsis in term pregnancies. Regular antenatal care prevents these poor outcomes to a large extent, while low birth weight increases the risks of PROM. Multivariate analysis confirms that prolonged rupture duration, low birth weight, abnormal antenatal care, low Apgar score, and prior gestational age are independent predictors of neonatal sepsis. These findings support active management of the term PROM, particularly in the case of greater than 12 hours rupture, to limit infectious morbidity and improve maternal and neonatal outcomes.

VII. Recommendations

Future studies should include multicenter randomized controlled trials comparing different management protocols for term PROM with standardized outcome measurement. The formation of predictive models incorporating clinical and biochemical markers to diagnose cases of high-risk PROM that require aggressive therapy would be useful in optimizing clinical decision-making and resource allocation.

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