Comparative study of maternal morbidity in induced versus expectantly managed term premature rupture of membranes: A randomized controlled trial

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Abstract

Introduction: Premature rupture of membranes (PROM) at term, defined as the spontaneous rupture of the amniotic sac before the onset of labor at or after 37 weeks of gestation, remains a common obstetric event, occurring in approximately 8–10% of all pregnancies. This study aims to evaluate and compare maternal outcomes, particularly morbidity such as puerperal sepsis, in women with term PROM managed with induction versus those managed expectantly.

Methods: This randomized controlled trial was conducted at the Department of Obstetrics and Gynecology in the Institute of Child and Mother Health (ICMH), Matuail, Dhaka, from March 2012 to February 2013. One hundred patients of PROM admitted to ICMH were selected for the study as convenience sampling. Data were analyzed by the Statistical Package for the Social Sciences for Windows, and statistical analysis was done using percentage, frequency, mean ± standard deviation, Chi-square test, etc. $P < 0.05$ was considered statistically significant.

Results: Obstetric histories were largely similar, though stillbirth was significantly higher in the expectant group (16% vs. 4%, $P = 0.045$). The groups were comparable in gestational age. The induction group had significantly higher rates of anemia (92% vs. 72%, $P = 0.009$), edema (32% vs. 14%, $P = 0.032$), and lower blood pressure. Notably, puerperal sepsis occurred only in the expectant group (14%, $P = 0.006$), indicating better maternal outcomes with induction.

Conclusion: This controlled study comparing labor induction and expectant management in term PROM highlights that timely induction is associated with better maternal outcomes, particularly a significant reduction in puerperal sepsis, improved antenatal care utilization, and fewer hypertensive changes.

Keywords: Anemia, maternal morbidity, premature rupture of membranes, puerperal sepsis

Introduction

Premature rupture of membranes (PROM) is characterized by rupture of the fetal membranes before labor. Rupture of the membranes may occur at any time during pregnancy. It becomes a problem if the fetus is preterm (preterm PROM), or, in the case of a term fetus, if the period between

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rupture of the membranes and the onset of labor is prolonged. Rupture of the membrane for >24 h before delivery is called prolonged rupture of membranes. It occurs in approximately 10% of all pregnancies, and in 70% of the cases, it occurs in pregnancies at term. Preterm PROM occurs in 3% of all pregnancies and is responsible for approximately 30% of all preterm deliveries.[1] PROM is an important cause of preterm labor, prolapse of the cord, placental abruption, and intrauterine infection. Chorioamnionitis is an important sequel of PROM and may precede endomyometritis or puerperal sepsis. In extremely prolonged rupture of the membranes, the fetuses may have an appearance similar to that of Potter's syndrome. If rupture of the membrane occurs early in pregnancy at <26 weeks, it can cause pulmonary hypoplasia and limb positioning defects in the newborn.[2] For prolonged preterm pre-labor rupture of the membranes, serial cultures may help to define vaginal colonization. All women with spontaneous preterm labor or preterm premature rupture of the membranes should have a low vaginal swab sent for Group B *Streptococcus* (GBS) and a high vaginal swab for other pathogens at the time of initial assessment.[3] If the pre-labor rupture of the membrane has exceeded 24 h, it may be prudent to start antibiotic treatment with broad coverage.[4] Maternal antibiotic prophylaxis should be provided in the context of preterm labor and prolonged rupture of membranes, even if maternal GBS status is negative.[5] Antibiotic prophylaxis during labor for women with risk factors for GBS is effective in preventing GBS transmission to the neonate and in reducing early-onset GBS sepsis.[3] GBS colonization of the newborn is reduced when antibiotics are given at least 1 h before birth.[6] PROM at term – defined as the rupture of fetal membranes before the onset of labor after 37 completed weeks of gestation – is a common obstetric event, occurring in approximately 8–10% of term pregnancies.[7] While spontaneous labor ensues in most women within 24 h, management strategies for term PROM vary and include either expectant management or active induction of labor.[8] The choice of management has critical implications for maternal and neonatal outcomes. Expectant management allows time for spontaneous labor but may increase the risk of ascending infections, such as chorioamnionitis and puerperal sepsis, particularly with prolonged rupture of membranes. On the other hand, induction of labor – commonly with oxytocin or prostaglandins – aims to reduce infectious morbidity by minimizing the latency period, though it may be associated with increased intervention rates and maternal discomfort.[9,10] Given the ongoing debate regarding the optimal approach, this study aims to compare maternal morbidity between induced and expectantly managed cases of term PROM.

Methods

This randomized controlled trial was conducted at the Department of Obstetrics and Gynecology in the Institute of Child and Mother Health (ICMH), Matuail, Dhaka, from March 2012 to February 2013. One hundred patients of PROM admitted to ICMH were selected for the study as convenience sampling. This study included 50 patients as cases: Patients with term PROM (gestational age 37–42 weeks) who received induction of labor, and 50 patients as a comparative group: Patients with term PROM (gestational age 37–42 weeks) who received conservative treatment. Data were collected from cases and comparative groups using a data collection sheet. Cases received induction of labor by tablet misoprostol 25 μg vaginally; we repeated the dose after 4 h. The comparative group received expectant management; they were just kept waiting with conservative treatment for 48 h. Data were analyzed by the Statistical Package for the Social Sciences for Windows, and statistical analysis was done using percentage, frequency, mean ± standard deviation, Chi-square test, etc. $P < 0.05$ was considered statistically significant.

Inclusion criteria

- Patients with term premature rupture of membranes were included in the study.

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Exclusion criteria

- Patients with preterm premature rupture of the membrane with other obstetric and medical complications, such as previous cesarean section, diabetes mellitus, hypertension, and other medical disorders, were excluded from the study.

Results

The majority of participants in both groups were between 20 and 29 years of age. The mean age was slightly lower in the case group (23.6 ± 3.9 years) compared to the comparative group (24.9 ± 4.1 years), though this difference was not statistically significant ($P > 0.05$). This indicates a comparable age distribution between the groups [Table 1].

Most participants in both groups belonged to the low-income category, especially in the case group (68%). However, the difference in socioeconomic status distribution was not statistically significant ($P = 0.301$), suggesting that economic background was similar between the groups [Table 2].

Regular antenatal check-ups were more common in the case group (84%) than in the comparative group (70%), although the difference did not reach statistical significance ($P = 0.096$). This may suggest better prenatal care in the case group [Table 3].

Parity distribution was similar across both groups. Although not statistically significant, a higher proportion of abortions and PROM was noted in the case group. Importantly, a significantly higher rate of stillbirth was observed in the comparative group ($P = 0.045$), which may indicate a worse obstetric outcome in that group [Table 4].

Most deliveries occurred between 37 and 40 weeks in both groups. The mean gestational age was comparable ($P > 0.05$), and no significant difference was observed in the gestational age distribution [Table 5].

Anemia and edema were significantly more prevalent in the case group ($P < 0.05$). Blood pressure (BP) was significantly lower in the case group. Although pulse, height, and temperature were similar, the case group had a significantly higher weight ($P = 0.007$), suggesting possible physiological variations between the groups [Table 6].

Puerperal sepsis was reported only in the comparative group, and the difference was statistically significant ($P = 0.006$). This reflects a better maternal outcome in the case group [Table 7].

Table 1: Distribution of the study subjects according to age (n=100)

Age group	Case (n=50)	Percentage	Comparative group (n=50)	Percentage	P-value
≤19	10	20.0	5	10.0	0.128 NS
20–24	18	36.0	20	40.0	
25–29	12	24.0	15	30.0	
≥30	8	16.0	10	20.0	
Mean±standard deviation	23.6±3.9		24.9±4.1		>0.05 NS
Age range	18–32		21–32		-

NS = Not Significant

Table 2: Distribution according to socioeconomic status (n=100)

Income group (Tk/month)	Case (n=50)	Percentage	Comparative group (n=50)	Percentage	P-value
Low (<5,000)	34	68.0	29	58.0	0.301 NS
Lower-middle (5,000–20,000)	16	32.0	21	42.0	

NS = Not Significant

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Table 3: Distribution according to antenatal check-up (*n*=100)

ANC status	Case (*n*=50)	Percentage	Comparative group (*n*=50)	Percentage	*P*-value
Irregular	8	16.0	15	30.0	0.096 NS
Regular	42	84.0	35	70.0	

NS = Not Significant

Table 4: Obstetrical history of the participants (*n*=100)

Obstetrical history	Case (*n*=50)	Percentage	Comparative group (*n*=50)	Percentage	*P*-value
Primi	28	56.0	29	58.0	0.839 NS
Multi	22	44.0	21	42.0	
History of abortion	22	44.0	15	30.0	0.147 NS
History of stillbirth	2	4.0	8	16.0	0.045 S
Previous premature rupture of membranes	12	24.0	15	30.0	0.499 NS

NS = Not Significant

Table 5: Distribution by gestational age (*n*=100)

Gestational age group	Case (*n*=50)	Percentage	Comparative group (*n*=50)	Percentage	*P*-value
37–38 weeks	32	64.0	35	70.0	0.604 NS
39–40 weeks	16	32.0	15	30.0	
>40 weeks	2	4.0	0	0.0	
Mean±standard deviation (weeks)	38.2±1.2		38.0±1.1		>0.05 NS
Range (weeks)	37–41		37–40		-

NS = Not Significant

Table 6: General condition of the participants (*n*=100)

Parameter	Case (*n*=50)	Percentage/ mean±SD	Comparative group (*n*=50)	Percentage/ mean±SD	*P*-value
Anemia	46	92.0	36	72.0	0.009 S
Edema	16	32.0	7	14.0	0.032 S
Normal temperature	48	96.0	49	98.0	0.500 NS
Pulse (bpm)	-	84.4±5.8	-	88±13.2	0.085 NS
Systolic BP (mmHg)	-	109.8±10.5	-	119±8.0	0.001 S
Diastolic BP (mmHg)	-	70.4±7.8	-	79±8.0	0.001 S
Height (feet)	-	5.1±0.1	-	5.1±0.2	0.170 NS
Weight (kg)	-	53.3±6.1	-	49.3±6.2	0.007 S

SD: Standard deviation, BP: Blood pressure. S = Significant, NS = Not Significant

Table 7: Maternal outcome (*n*=100)

Complication	Case (*n*=50)	Percentage	Comparative Group (*n*=50)	Percentage	*P*-value
Puerperal Sepsis	0	0.0	7	14.0	0.006 S*

*Fisher's exact test used

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Discussion

In this study, the mean age was 23.6 ± 3.9 years in the induced group and 24.9 ± 4.1 years in the expectant group. In this research, the mean gestational age on admission was 38.2 ± 1.2 weeks in the case and 38.0 ± 1.1 weeks in the comparative group, which was not statistically significant. Similar results were found in other previous studies.[11] In this current study, it was found that PROM was more common in low-income families in both groups. Regular antenatal check-ups were received by 84.0% of the induced group and 70.0% of the expectant group; no significant (P > 0.05) difference was found between the two groups. Regular antenatal check-ups were more prevalent in the case group (84%) than in the comparative group (70%), although this did not reach statistical significance (P = 0.096). In a study by Majoko et al.,[12] only 66% of participants reported regular antenatal care visits, which were significantly associated with reduced obstetric complications. Similarly, Nisar and White[13] in Pakistan observed that only 60% of women attended four or more antenatal visits, indicating a persistent gap in care that may affect outcomes. Parity distribution in our study was comparable between groups (primi: 56% vs. 58%, P = 0.839). The prevalence of previous abortions was higher in the case group (44% vs. 30%), whereas the comparative group had a significantly greater history of stillbirths (16% vs. 4%, P = 0.045). This aligns with McClure et al.,[14] who reported that stillbirth rates were higher (12–25%) among women with fewer antenatal contacts and inadequate obstetric monitoring. Gestational age at delivery did not differ significantly between groups. Most participants delivered between 37 and 40 weeks, with a mean of 38.2 ± 1.2 weeks in the case group and 38.0 ± 1.1 weeks in the comparative group (P > 0.05). Caughey et al.[15] reported a similar mean gestational age of 38.5 weeks in their cohort, with slightly higher rates of complications beyond 40 weeks. Anemia was highly prevalent in both groups, but was significantly more common in the case group (92% vs. 72%, P = 0.009). In contrast, a study by Lone et al.,[16] reported anemia in 52% of pregnant women, still indicating a widespread problem. Edema was also more frequent in the case group (32% vs. 14%, P = 0.032), possibly indicating subclinical hypertensive disorders. However, systolic and diastolic BP values were significantly lower in the case group (109.8/70.4 mmHg) than in the comparative group (119/79 mmHg) (P = 0.001 for both). In contrast, Hall et al.,[17] reported an average systolic BP of 120.7 mmHg in women with adverse maternal outcomes, indicating that even moderate elevations may influence prognosis. Although temperature and pulse were comparable across groups, maternal weight was significantly higher in the case group (53.3 ± 6.1 kg vs. 49.3 ± 6.2 kg, P = 0.007). This could be linked to nutritional status or edema. According to World Health Organization data,[18] maternal anthropometric indicators, particularly weight <50 kg, are associated with increased risk of PROM and poor outcomes. Most significantly, puerperal sepsis occurred only in the comparative group (14%, P = 0.006). This is a critical finding, as puerperal sepsis remains a leading cause of maternal mortality in developing countries. Dolea and Stein[19] estimated maternal sepsis incidence to range from 5 to 15% in low-resource settings without adequate hygiene protocols. Similarly, a study by Goldenberg et al.,[20] noted a 12% sepsis rate in expectantly managed PROM cases versus 3% in induced labor cases. Previous PROM was reported in 24% of the case group and 30% of the comparative group (P = 0.499), echoing the 22% recurrence rate reported by Mercer[21] in women with a prior history of PROM. The statistically significant reduction in maternal sepsis in the induction group is consistent with Hannah et al.'s landmark randomized trial,[22] which reported significantly lower infection rates with immediate induction (4% vs. 8%). Similar findings were echoed in a subsequent meta-analysis by Mozurkewich and Hutton,[23] reinforcing that induction reduces the risk of maternal infection in term PROM.

Limitations of the study

The study was conducted in a single hospital with a small sample size. Hence, the results may not

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represent the whole community. Moreover, the diagnosis of PROM was made mostly from the history of the patient. The majority of the patients were admitted in the latent or active phase of labor, and the cases had to be excluded from the study.

Conclusion

This controlled study comparing labor induction and expectant management in term PROM highlights that timely induction is associated with better maternal outcomes, particularly a significant reduction in puerperal sepsis, improved antenatal care utilization, and fewer hypertensive changes. Although parity and gestational age distributions were similar between groups, the expectant group showed a higher incidence of stillbirths and infections.

Recommendation

Based on the findings of this study, it is recommended that labor induction be considered the preferred management strategy in terms of PROM cases to reduce the risk of maternal complications such as puerperal sepsis, especially when there are no contraindications to induction. Regular antenatal care and early identification of PROM remain essential for optimal maternal outcomes.

Funding

No funding sources.

Conflict of interest

None declared.

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