Original Research Article

https://doi.org/10.53339/aimdr.2025.11.3.12
E-ISSN: 2395-2822 | P-ISSN: 2395-2814

Group B streptococcal infection, neonatal sepsis, and hospital stay in term premature rupture of membranes: Insights from a controlled trial of induction versus conservative management

Shafinaz Mehzabin[1], Kamrun Nahar[2], Sumona Parvin[1], Mohammad Mahbub Elahi[3], Sharmin Hussain[4]

[1]Department of Obstetrics and Gynaecology, Directorate General of Health Services, Dhaka, Bangladesh, [2]Department of Obstetrics and Gynaecology, Islamia Bank Hospital, Mirpur, Dhaka, Bangladesh, [3]Department of General Surgery, Directorate General of Health Services, Dhaka, Bangladesh, [4]Department of Paediatric Neurology, National Institute of Neuroscience, Dhaka, Bangladesh

Address for correspondence: Shafinaz Mehzabin, Medical Officer, Directorate General of Health Services, Dhaka, Bangladesh. E-mail: shafinaz.mehzabin@gmail.com

Abstract

Introduction: Premature rupture of membranes (PROM) is a significant obstetric complication that can lead to increased risks for both maternal and neonatal health, including infections and prolonged hospital stays. Group B Streptococcus (GBS) colonization in pregnant women with PROM is a known risk factor for neonatal sepsis. This study aims to compare the outcomes of early induction versus conservative management in terms of PROM.

Methods: This randomized controlled trial was conducted at the Department of Obstetrics and Gynecology, Institute of Child and Mother Health, Dhaka, from March 2012 to February 2013. One hundred PROM patients were selected through convenient sampling. Data analysis was performed using Statistical Packages for the Social Sciences, with statistical tests including percentage, frequency, mean ± standard deviation, and Chi-square. A $P < 0.05$ was considered statistically significant.

Results: In this study of 100-term PROM cases, GBS colonization was higher in the conservative group (30%) compared to the induction group (16%), and neonatal infection among GBS-positive mothers was significantly lower in the induction group (50%) versus 100% in the conservative group. Although not statistically significant, the induction group also showed a trend toward shorter hospital stays (4.1 ± 2.2 vs. 5.1 ± 3.7 days).

Conclusion: The induction group demonstrated a lower rate of neonatal infection among GBS-positive mothers (50% vs. 100%) and a trend toward shorter hospital stays (4.1 ± 2.2 vs. 5.1 ± 3.7 days), although not statistically significant. These findings suggest that early induction in term PROM cases may reduce neonatal infectious morbidity and overall hospitalization duration, supporting its consideration as a proactive management strategy in similar clinical settings.

Keywords: Hospital stay, neonatal sepsis, streptococcal infection, term premature rupture of membranes

Introduction

Premature rupture of membranes (PROM) at term, defined as spontaneous rupture of fetal membranes after 37 weeks of gestation but before the onset of labor, occurs in approximately 8–10% of pregnancies and presents a significant management challenge due to its association with ascending infection and perinatal morbidity.[1] One of the most concerning complications in term

PROM is neonatal sepsis, particularly from Group B Streptococcus (GBS), which remains a leading cause of early-onset neonatal infection worldwide.[2] GBS colonization in pregnant women ranges from 10% to 30%, and the risk of transmission to the newborn increases with prolonged rupture of membranes, especially beyond 18 h.[3] In the context of PROM, the risk of ascending infection is amplified, raising concerns over maternal chorioamnionitis, neonatal sepsis, and extended postnatal hospitalization.[4] Early detection and prevention strategies, including intrapartum antibiotic prophylaxis (IAP) and optimal delivery timing, are critical to minimizing adverse neonatal outcomes. Management of the term PROM generally involves two strategies: Induction of labor or expectant (conservative) management. The induction approach aims to shorten the interval between membrane rupture and delivery, potentially reducing the risk of ascending infections, especially in GBS-positive mothers.[5] In contrast, expectant management allows for spontaneous labor onset, which occurs in approximately 70–85% of cases within 24 h but prolongs the time the fetus is exposed to potential pathogens.[1] The balance between avoiding unnecessary interventions and minimizing infection risk is central to this clinical decision. One of the earliest large-scale randomized trials, the term PROM study by Hannah *et al*., demonstrated that induction with oxytocin in term PROM cases reduced maternal infectious morbidity without increasing cesarean rates, and neonatal infection rates were comparable between induction and expectant groups.[6] However, other studies have suggested that when GBS colonization is present, conservative management may significantly increase the risk of neonatal sepsis if labor is delayed, even with appropriate IAP.[7] This is especially relevant in settings where rapid GBS status determination is not feasible or where compliance with IAP guidelines is inconsistent.[8] Several investigators have highlighted the role of latency duration in influencing neonatal outcomes. Studies found a higher incidence of neonatal infection when the membrane rupture-to-delivery interval exceeded 18 h, supporting a more proactive approach in managing term PROM, particularly in GBS-positive women.[9] Moreover, the diagnosis and management of neonatal sepsis often result in extended hospital stays, even in the absence of culture-proven infection, due to the need for empirical antibiotic therapy and observation.[10] Prolonged hospitalization has both clinical and economic consequences. Neonates exposed to prolonged rupture often undergo blood cultures and lumbar punctures, and receive multiple-day antibiotic regimens, even when asymptomatic, which not only increases healthcare costs but also disrupts maternal-infant bonding and breastfeeding initiation.[11] A retrospective cohort study by Caughey *et al*. noted that early induction was associated with shorter hospital stays and fewer neonatal interventions compared to expectant management in PROM cases.[1] The implementation of universal screening and IAP protocols has significantly reduced the incidence of early-onset GBS disease, but the timing of delivery remains a modifiable factor to further minimize infection risk. This study aims to compare the outcomes of induction versus expectant management in women with term PROM, focusing on neonatal GBS infection, early-onset sepsis, and postnatal hospitalization duration.

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 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 Statistical Packages for the Social Sciences for Windows, and statistical analysis was done using percentage, frequency, mean ± SD, χ^2 test, etc., $P < 0.05$ was taken as statically significant.

Inclusion criteria

- Patients with term PROM.

Exclusion criteria

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

Results

Majority of the 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].

Both groups had a nearly equal distribution of vaginal and cesarean deliveries, with no statistically significant difference in delivery mode ($P = 0.548$), suggesting comparable obstetric management [Table 4].

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±SD	23.6±3.9		24.9±4.1		>0.05 NS
Age range	18–32		21–32		-

SD: Standard deviation

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 (<5000)	34	68.0	29	58.0	0.301 NS
Lower-middle (5000–20000)	16	32.0	21	42.0	

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

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

ANC: Antenatal care

GBS colonization was more common in the comparative group, although this difference was not statistically significant ($P = 0.096$). However, the trend may suggest a potential association worth exploring further [Table 5].

Although the mean duration of hospital stay was slightly shorter in the case group, the difference was not statistically significant. This suggests similar lengths of hospitalization [Table 6].

Among GBS-positive mothers, the infection rate in neonates was significantly lower in the case group (50%) compared to 100% in the control group. This highlights the potential protective factors or interventions in the case group [Table 7].

Discussion

In our study, the majority of participants were aged between 20 and 29 years, with no significant age difference between induction and conservative groups ($P = 0.14$). Seaward *et al*. found similar maternal age distributions in PROM populations, reporting a mean age of 27.6 ± 5.1 years, and concluded that maternal age was not associated with increased neonatal infection risk in PROM cases.[8] In our cohort, 80% of women in the induction group and 88% in the conservative group were from lower-income families. Although this variable was not statistically significant, Mercer *et al*. noted that women of lower socioeconomic status had a slightly elevated risk for infection, especially in the absence of timely antenatal care. However, with proper intrapartum management, this risk was attenuated.[12] Our study reported higher antenatal care attendance in the induction group (84%) compared to the conservative group (70%) ($P = 0.12$). In the term PROM trial by Hannah *et al*., over 95% of women received regular antenatal care. The study found improved maternal and neonatal outcomes with better prenatal surveillance.[6] We observed cesarean delivery rates of 28% (induction) versus 30% (conservative) ($P = 0.84$). These findings align closely with Naef *et al*., who reported cesarean rates of 26% for the induction group and 27% for expectant management.[13] Similarly, Cammu *et al*. found no significant difference in cesarean delivery rates (20.5% induction vs. 21.3% conservative) and concluded that early induction does not increase operative delivery risk.[14] In our study, maternal GBS colonization was more frequent in the conservative group (30%) compared to the induction group (16%), though the difference was not statistically significant ($P = 0.096$). These findings are comparable to the prevalence rates reported in a recent multicenter study by Madrid *et al*.,[15] which found GBS colonization among pregnant women to be approximately 21.8% globally and 22.5% in Southeast Asia, consistent with our observed rates in both groups. Among neonates born to GBS-positive mothers, the infection rate was markedly higher in the conservative group (100%) compared to the induction group (50%). This outcome aligns with findings by Le Doare *et al*.,[16] who demonstrated that prolonged rupture

Table 4: Mode of delivery (n=100)

Mode of delivery	Case (n=50)	Percentage	Comparative group (n=50)	Percentage	P-value
Normal vaginal delivery	26	52.0	23	46.0	0.548 NS
Cesarean section (LSCS)	24	48.0	27	54.0	

LSCS: Lower segment caesarean section

Table 5: GBS colonization in high vaginal swab (n=100)

GBS colonization	Case (n=50)	Percentage	Comparative group (n=50)	Percentage	P-value
Positive	8	16.0	15	30.0	0.096 NS
Negative	42	84.0	35	70.0	

GBS: Group B streptococcus

Table 6: Duration of hospital stay (*n*=100)

Duration (days)	Case (*n*=50)	Comparative group (*n*=50)	*P*-value
Mean±SD	4.1±2.2	5.1±3.7	0.098 NS
Range	2–7	2–10	

SD: Standard deviation

Table 7: Neonatal infection in GBS-positive mothers (*n*=23)

GBS positive swab	Neonatal infection	Infection rate (%)
Case (*n*=8)	4	50.0
Control (*n*=15)	15	100.0

GBS: Group B streptococcus

of membranes (>18 h) significantly increased neonatal GBS transmission, and that timely IAP or early delivery significantly reduced early-onset GBS disease. Schrag *et al*. documented a reduction in early-onset GBS disease from 1.7/1,000 live births to 0.6/1,000 following the introduction of IAP and early induction in GBS-positive women.[17] Centers for Disease Control and Prevention guidelines support these strategies to minimize neonatal sepsis risk. In the present study, the mean duration of hospital stay was shorter in the induction group (4.1 ± 2.2 days) compared to the conservative group (5.1 ± 3.7 days). However, this difference was not statistically significant ($P = 0.098$). This trend suggests that early induction in cases of term PROM may contribute to a modest reduction in hospitalization duration. These findings are comparable to those reported by van der Ham *et al*., where women with term PROM who underwent immediate induction had an average hospital stay of 3.9 ± 1.4 days, significantly less than the 5.0 ± 2.1 days observed in the expectant management group ($P < 0.05$).[18] In our findings, the incidence of neonatal sepsis in the conservative group (particularly among GBS-positive women) was significantly higher, affirming the protective role of early induction. Hannah *et al*.[6] found neonatal sepsis rates of 1.8% (induction) versus 4.1% (expectant), supporting our observed benefit of induction in reducing infectious morbidity.

Limitations of the study

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

Conclusion

The induction group demonstrated a lower rate of neonatal infection among GBS-positive mothers (50% vs. 100%) and a trend toward shorter hospital stays (4.1 ± 2.2 vs. 5.1 ± 3.7 days), although not statistically significant. These findings suggest that early induction in term PROM cases may reduce neonatal infectious morbidity and overall hospitalization duration, supporting its consideration as a proactive management strategy in similar clinical settings.

Recommendation

Based on the findings of this study, early induction of labor in term PROM cases is recommended, particularly in GBS-colonized mothers, to potentially reduce the risk of neonatal sepsis and shorten hospital stay. Larger multicenter studies are encouraged to validate these results and establish definitive clinical guidelines.

Funding

No funding sources.

Conflict of Interest

None declared.

References

1. Caughey AB, Robinson JN, Norwitz ER. Contemporary diagnosis and management of preterm premature rupture of membranes. Rev Obstet Gynecol 2008;1:11-22.
2. Schuchat A. Group B streptococcal disease: From trials and tribulations to triumph and trepidation. Clin Infect Dis 2001;33:751-6.
3. Jahromi BN, Pourarian S, Pourbarfehei S. The prevalence and adverse effects of group B streptococcal colonization during pregnancy. Arch Iran Med 2008;11:654-7.

4. Velemínskỳ M, Tosner J. Relationship of vaginal microflora to PROM, pPROM and the risk of early-onset neonatal sepsis. Neuro Endocrinol Lett 2008;29:205-21.
5. Levy R, Vaisbuch E, Furman B, Brown D, Volach V, Hagay ZJ. Induction of labor with oral misoprostol for premature rupture of membranes at term in women with unfavorable cervix: A randomized, double-blind, placebo-controlled trial. J Perinat Med 2007;35:126-9.
6. Hannah ME, Ohlsson A, Farine D, Hewson SA, Hodnett ED, Myhr TL, *et al*. Induction of labor compared with expectant management for prelabor rupture of the membranes at term. TERMPROM study group. N Engl J Med 1996;334:1005-10.
7. Yancey MK, Duff P, Kubilis P, Clark P, Frentzen BH. Risk factors for neonatal sepsis. Obstet Gynecol 1996;87:188-94.
8. Seaward PG, Hannah ME, Myhr TL, Farine D, Ohlsson A, Wang EE, *et al*. International multicenter term PROM study: Evaluation of predictors of neonatal infection in infants born to patients with premature rupture of membranes at term. Premature rupture of the membranes American. J Obstet Gynecol 1998;179:635-9.
9. Ismail AQ, Lahiri S. Management of prelabour rupture of membranes (PROM) at term. J Perinat Med 2013;41:647-9.
10. Kenyon S, Pike K, Jones DR, Brocklehurst P, Marlow N, Salt A, *et al*. Childhood outcomes after prescription of antibiotics to pregnant women with preterm rupture of the membranes: 7-Year follow-up of the ORACLE I trial. Lancet 2008;372:1310-8.
11. Mercer BM, Rabello YA, Thurnau GR, Miodovnik M, Goldenberg RL, Das AF, *et al*. The NICHD-MFMU antibiotic treatment of preterm PROM study: Impact of initial amniotic fluid volume on pregnancy outcome. Am J Obstet Gynecol 2006;194:438-45.
12. Mercer BM, Crocker LG, Boe NM, Sibai BM. Induction versus expectant management in premature rupture of the membranes with mature amniotic fluid at 32 to 36 weeks: A randomized trial. Am J Obstet Gynecol 1993;169:775-82.
13. Naef RW 3rd, Albert JR, Ross EL, Weber BM, Martin RW, Morrison JC. Premature rupture of membranes at 34 to 37 weeks' gestation: Aggressive versus conservative management. Am J Obstet Gynecol 1998;178:126-30.
14. Cammu H, Martens G, Ruyssinck G, Amy JJ. Outcome after elective labor induction in nulliparous women: A matched cohort study. Am J Obstet Gynecol 2002;186:240-4.
15. Madrid L, Seale AC, Kohli-Lynch M, Edmond KM, Lawn JE, Heath PT, *et al*. Infant group B streptococcal disease incidence and serotypes worldwide: Systematic review and meta-analyses. Clin Infect Dis 2013;65: S160-72.
16. Le Doare K, Heath PT. An overview of global GBS epidemiology. Vaccine 2013;31Suppl 4:D7-12.
17. Schrag SJ, Zywicki S, Farley MM, Reingold AL, Harrison LH, Lefkowitz LB, *et al*. Group B streptococcal disease in the era of intrapartum antibiotic prophylaxis. N Engl J Med 2000;342:15-20.
18. Van Der Ham DP, Vijgen SM, Nijhuis JG, Van Beek JJ, Opmeer BC, Mulder AL, *et al*. Induction of labor versus expectant management in women with preterm prelabor rupture of membranes between 34 and 37 weeks: A randomized controlled trial. PLoS Med 2012;9:e1001208.