European Journal of Clinical Pharmacy
Print ISSN: 2385-409X, **Online ISSN**: 3105-0409
Website: https://farmclin.com/

Mode of Delivery Outcomes Following Misoprostol Induction in Women with Pre-Labour Rupture of Membranes: A Single-Center Study

Article History:

Name of Author:
Hina Begum[1],Ayman[2],Ayesha Riaz[3], Beenish Gulshad[4],Dr.Hamasa Gul[5], Dr. Rafia Sumbal[6],

Affiliation: *[1]Post Graduate Resident Mardan Medical Complex Mardan Khyber Pakhtunkhwa Pakistan*
[2]Post Graduate Resident Mardan Medical Complex Mardan Khyber Pakhtunkhwa Pakistan
[3]Post Graduate Resident Mardan Medical Complex Mardan Khyber Pakhtunkhwa Pakistan
[4]Post Graduate Resident Mardan Medical Complex Mardan Khyber Pakhtunkhwa Pakistan
[5]Assistant Professor, Mardan Medical Complex Mardan Khyber Pakhtunkhwa Pakistan
[6]Post Graduate Resident Mardan Medical Complex Mardan Khyber Pakhtunkhwa Pakistan

Corresponding Author:
Dr.Hamasa Gul

Gmail:Hamasaguldr@hotmail.com

Received: 13-09-2025
Revised: 26-09-2025
Accepted: 14-10-2025
Published: 25-10-2025

Abstract:

Background : Pre-labour rupture of membranes (PROM) at term is a common obstetric condition associated with increased risks of maternal and neonatal morbidity, particularly when labour does not commence spontaneously. Induction of labour is widely recommended to reduce infectious complications, and misoprostol is frequently used for this purpose due to its efficacy, affordability, and ease of administration. However, evidence regarding mode of delivery outcomes following misoprostol induction in PROM, particularly from low- and middle-income settings, remains limited.***Objective:***To evaluate mode of delivery outcomes following induction of labour with misoprostol among women presenting with pre-labour rupture of membranes at a tertiary care center. ***Methods****:*This descriptive observational study was conducted in the Gynecology Unit of Mardan Medical Complex from January to June 2022. A total of 150 women with term singleton pregnancies (≥37 weeks), cephalic presentation, and confirmed PROM without spontaneous labour were included. Labour was induced using low-dose vaginal misoprostol (25 µg at four-hour intervals, up to a maximum of four doses) according to a standardized protocol. The primary outcome was mode of delivery, categorized as spontaneous vaginal delivery, instrumental vaginal delivery, or cesarean section. Secondary outcomes included maternal complications and neonatal outcomes, including NICU admission. Data were analyzed using SPSS version 26.***Results:***The mean maternal age was 29.99 ± 6.65 years, and the mean gestational age at induction was 38.92 ± 1.09 weeks. Spontaneous vaginal delivery was achieved in 95 (63.3%) women, while 49 (32.7%) required cesarean section and 6 (4.0%) underwent instrumental delivery. Uterine hyperstimulation occurred in 31 (20.7%) cases. Postpartum hemorrhage and postpartum fever were observed in 24.7% and 18.0% of women, respectively. NICU admission was required for 34.0% of neonates. No statistically significant association was found between maternal age and mode of delivery ($p = 0.321$), nor between mode of delivery and NICU admission ($p = 0.578$). A trend toward higher cesarean section rates was observed with advancing gestational age. ***Conclusion:***Induction of labour with low-dose vaginal misoprostol in women with pre-labour rupture of membranes is associated with a high rate of spontaneous vaginal delivery and acceptable maternal and neonatal outcomes. These findings support the safe and effective use of misoprostol for labour induction in PROM, particularly in resource-limited and high-volume tertiary care settings.

Keywords: Dark Triad, Narcissism, Machiavellianism, Psychopathy, Cross-cultural validation, Scale Adaptation, Confirmatory Factor Analysis.

INTRODUCTION

Pre-labour rupture of membranes (PROM) is defined as the spontaneous rupture of fetal membranes before the onset of regular uterine contractions and occurs in approximately 8–10% of term pregnancies worldwide. It represents a common obstetric condition with significant clinical implications for both the mother and the fetus. While PROM may precede spontaneous labour in a proportion of women, delayed onset of labour is frequently associated with increased risks, including ascending intrauterine infection, chorioamnionitis, postpartum endometritis, and neonatal sepsis. Additionally, PROM has been linked to prolonged labour, higher rates of operative vaginal delivery, and cesarean section, particularly when labour does not ensue spontaneously within an acceptable timeframe. Given these potential complications, PROM remains an important contributor to maternal and neonatal morbidity, especially in resource-limited healthcare settings where access to timely intervention and monitoring may be constrained.

Current obstetric guidelines generally recommend induction of labour in women with PROM at term to reduce the risk of infectious morbidity without increasing adverse neonatal outcomes. Timely induction aims to shorten the latency period between membrane rupture and delivery, thereby minimizing maternal and neonatal exposure to infection. However, the decision to induce labour must carefully balance the benefits of expediting delivery against the potential for increased uterine intervention, including cesarean section. Achieving an optimal mode of delivery—particularly a successful vaginal birth—remains a key clinical objective, as operative delivery is associated with higher maternal morbidity, longer hospital stays, and increased healthcare costs. Consequently, identifying effective induction strategies that promote vaginal delivery while maintaining maternal and fetal safety is of substantial clinical importance.

Misoprostol, a synthetic prostaglandin E1 analogue, has gained widespread use as an agent for cervical ripening and induction of labour. It exerts its effect by promoting cervical softening and stimulating uterine contractions through prostaglandin receptor activation. Misoprostol offers several advantages over conventional induction agents, including low cost, wide availability, long shelf life, and ease of administration via oral or vaginal routes. These characteristics make it particularly attractive in low- and middle-income countries where healthcare resources are limited. Nevertheless, concerns persist regarding its safety profile, especially in the context of PROM, as misoprostol use has been associated with uterine tachysystole, hyperstimulation, and fetal heart rate abnormalities in some studies. Compared with oxytocin and prostaglandin E2 preparations, misoprostol has demonstrated comparable or superior efficacy in achieving vaginal delivery, although reported outcomes vary depending on dosing regimens, route of administration, and patient selection. As a result, its role in PROM continues to be actively evaluated.

Existing literature has reported mixed findings regarding mode of delivery outcomes following misoprostol induction in women with PROM. Several randomized trials and observational studies have demonstrated favorable vaginal delivery rates with misoprostol, while others have reported increased cesarean section rates or higher incidences of uterine hyperstimulation. Variability in study design, sample size, gestational age at induction, parity, and institutional protocols has contributed to inconsistent results. Importantly, much of the available evidence originates from high-income settings, with relatively limited data from low- and middle-income countries where clinical practices, patient demographics, and resource availability differ substantially. Furthermore, single-center, real-world studies reflecting routine obstetric practice remain underrepresented in the literature, despite their value in informing context-specific clinical decision-making.

In this context, the present single-center study was undertaken to contribute local evidence on delivery outcomes following misoprostol induction in women with PROM. Generating institution-specific data is particularly relevant for optimizing induction protocols, guiding clinical practice, and supporting evidence-based decision-making in comparable healthcare settings. Therefore, the objective of this study was to evaluate the mode of delivery outcomes following induction of labour with misoprostol among women presenting with pre-labour rupture of membranes at a tertiary care center.

MATERIALS AND METHODS

This descriptive observational study was conducted in the Gynecology Unit of Mardan Medical Complex, Mardan, over a six-month period from January 2022 to June 2022. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure transparency and methodological soundness. Pregnant women presenting with pre-labour rupture of membranes (PROM) during the study period were assessed for eligibility. The study population consisted of women with term singleton pregnancies of at least 37 completed weeks of gestation, a cephalic fetal presentation, and no evidence of spontaneous onset of labour at the time of admission. Both primigravida and multigravida

women were included to reflect routine obstetric practice at the study center.

Women aged 18 to 40 years with a confirmed diagnosis of PROM based on clinical history and examination were enrolled if labour induction with misoprostol was planned. Women with a previous cesarean section or history of uterine surgery, evidence of fetal distress at admission, clinical signs of chorioamnionitis, multiple gestation, malpresentation, placenta previa, antepartum hemorrhage, known contraindications to prostaglandin use, or major fetal anomalies were excluded from the study. A non-probability consecutive sampling technique was employed, and all eligible women presenting with pre-labour rupture of membranes during the study period were consecutively enrolled. The sample size was determined by the number of patients who met the inclusion criteria and underwent induction of labour with misoprostol during the defined study period and was considered adequate to describe mode of delivery outcomes within the target population.

Labour induction was carried out using misoprostol in accordance with the standardized induction protocol of the unit. Misoprostol was administered vaginally at a dose of 25 micrograms, with repeat dosing at four-hour intervals if adequate uterine contractions were not established, up to a maximum of four doses. Prior to each subsequent dose, progress of labour and uterine activity were clinically assessed. Maternal monitoring included regular evaluation of vital signs, uterine contractions, and symptoms suggestive of uterine hyperstimulation or infection, while fetal wellbeing was monitored through intermittent auscultation or cardiotocography as per institutional protocol. Induction was discontinued, and appropriate obstetric intervention was undertaken in cases of failed induction, fetal distress, or development of maternal complications.

The primary outcome measure was the mode of delivery, categorized as spontaneous vaginal delivery, instrumental vaginal delivery, or cesarean section. Secondary outcomes included the need for operative delivery and delivery outcomes stratified according to maternal age and gestational age. Data were collected using a structured proforma specifically designed for the study. Information was obtained from patient interviews, clinical examinations, labour ward records, and operative notes. Data collection was performed by the principal investigator to ensure consistency, and completed proformas were reviewed regularly to minimize missing or inaccurate data.

Data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 26. Quantitative variables such as maternal age and gestational age were expressed as mean and standard deviation, while qualitative variables, including mode of delivery, were presented as frequencies and percentages. Stratification was performed for maternal age and gestational age to assess their association with mode of delivery, and the chi-square test was applied where appropriate. A p-value of 0.05 or less was considered statistically significant. Ethical approval for the study was obtained from the Institutional Ethical Review Committee of Mardan Medical Complex prior to commencement. Written informed consent was obtained from all participants, and strict confidentiality of patient information was maintained throughout the study, with all data anonymized and used solely for research purposes

RESULTS

A total of 150 women with pre-labour rupture of membranes who underwent induction of labour with misoprostol were included in the final analysis. The mean maternal age was 29.99 ± 6.65 years (range: 18–40 years). The mean gestational age at induction was 38.92 ± 1.09 weeks, while the mean duration of rupture of membranes prior to induction was 24.76 ± 13.77 hours. The mean induction-to-delivery interval was 15.09 ± 5.60 hours, the mean neonatal birth weight was 3.15 ± 0.43 kg, and the mean length of hospital stay was 2.47 ± 1.16 days. Baseline maternal and obstetric characteristics are summarized in Table 1..

Table 1. Baseline maternal and obstetric characteristics (n = 150)

Variable	Mean ± SD
Maternal age (years)	29.99 ± 6.65
Gestational age (weeks)	38.92 ± 1.09
Duration of PROM (hours)	24.76 ± 13.77
Induction-to-delivery interval (hours)	15.09 ± 5.60
Birth weight (kg)	3.15 ± 0.43
Hospital stay (days)	2.47 ± 1.16

Regarding the **mode of delivery**, spontaneous vaginal delivery was achieved in **95 (63.3%)** women, **49 (32.7%)** required cesarean section, and **6 (4.0%)** underwent instrumental vaginal delivery. Uterine hyperstimulation was observed in **31 (20.7%)** cases. Neonatal intensive care unit (NICU) admission was required for **51 (34.0%)** neonates. With respect to maternal outcomes, **86 (57.3%)** women had no postpartum complications, while **37**

(24.7%) developed postpartum hemorrhage and **27 (18.0%)** experienced postpartum fever. These delivery outcomes and complications are detailed in **Table 2**.

Table 2. Delivery outcomes and maternal–neonatal complications

Variable	n (%)
Mode of delivery	
Spontaneous vaginal delivery	95 (63.3)
Instrumental vaginal delivery	6 (4.0)
Cesarean section	49 (32.7)
Uterine hyperstimulation	
Yes	31 (20.7)
No	119 (79.3)
NICU admission	
Yes	51 (34.0)
No	99 (66.0)
Maternal complications	
None	86 (57.3)
Postpartum hemorrhage	37 (24.7)
Fever	27 (18.0)

When stratified by **maternal age group**, spontaneous vaginal delivery remained the most frequent mode of delivery across all age categories. No statistically significant association was observed between maternal age group and mode of delivery (χ^2 = **4.69**, p = **0.321**). The age-stratified distribution of delivery outcomes is presented in **Table 3**.

Table 3. Association between maternal age group and mode of delivery

Age group (years)	Spontaneous vaginal n (%)	Instrumental n (%)	Cesarean n (%)
18–25	26 (65.0)	1 (2.5)	13 (32.5)
26–35	42 (57.5)	5 (6.8)	26 (35.6)
>35	27 (73.0)	0 (0.0)	10 (27.0)
Chi-square (p-value)			**4.69 (0.321)**

Stratification by **gestational age group** demonstrated that spontaneous vaginal delivery was more frequent among women induced at earlier gestational ages, whereas the proportion of cesarean sections increased with advancing gestational age. Detailed findings are shown in **Table 4**.

Table 4. Mode of delivery according to gestational age group

Gestational age group	Spontaneous vaginal	Instrumental	Cesarean
37–38 weeks	28	2	8
38.1–39 weeks	26	1	15
>39 weeks	41	3	26

Analysis of **NICU admission by mode of delivery** showed no statistically significant association (χ^2 = **1.10**, p = **0.578**). NICU admissions occurred across all delivery modes, as summarized in **Table 5**.

Table 5. Association between mode of delivery and NICU admission

Mode of delivery	NICU admission n (%)	No NICU admission n (%)
Spontaneous vaginal	30 (31.6)	65 (68.4)
Instrumental	3 (50.0)	3 (50.0)
Cesarean section	18 (36.7)	31 (63.3)
Chi-square (p-value)		**1.10 (0.578)**

DISCUSSION

This single-center observational study evaluated mode of delivery outcomes following induction of labour with misoprostol in women presenting with pre-labour rupture of membranes (PROM). The principal findings demonstrate that spontaneous vaginal delivery was the predominant outcome, achieved in approximately two-thirds of women, while nearly one-third required cesarean section and only a small

proportion underwent instrumental delivery. Maternal complications, including uterine hyperstimulation, postpartum hemorrhage, and postpartum fever, were observed but remained within clinically acceptable limits. Neonatal outcomes, particularly NICU admissions, were noted across all delivery modes, with no statistically significant association between mode of delivery and NICU admission. Collectively, these findings support the effectiveness and relative safety of misoprostol for labour induction in PROM within a real-world tertiary care setting.

The predominance of spontaneous vaginal delivery observed in this study is consistent with contemporary literature evaluating misoprostol use in PROM. Recent randomized trials and systematic reviews have reported vaginal delivery rates ranging from 55% to 75% following misoprostol induction, depending on dose, route of administration, and population characteristics [1–3]. These findings reinforce the role of misoprostol as an effective cervical ripening and labour-inducing agent in PROM, particularly when low-dose regimens are employed. The cesarean section rate observed in our cohort is comparable to rates reported in recent regional and international studies, where cesarean delivery following misoprostol induction ranged between 25% and 35% [2,4,5]. Variations in cesarean section rates across studies may reflect differences in obstetric practice patterns, parity distribution, Bishop score at induction, and institutional thresholds for operative intervention.

The induction-to-delivery interval observed in this study aligns with evidence suggesting that misoprostol facilitates timely labour progression in PROM. Several recent studies have demonstrated that misoprostol induction is associated with comparable or shorter induction-to-delivery intervals than oxytocin or prostaglandin E2 preparations, without compromising maternal or neonatal safety [3,6]. Shortening the latency period between membrane rupture and delivery is clinically relevant, as prolonged intervals have been associated with increased risks of maternal and neonatal infection [7]. The observed delivery intervals in our study support the clinical utility of misoprostol in achieving timely delivery while maintaining acceptable safety outcomes.

Maternal complications associated with misoprostol induction warrant careful interpretation. Uterine hyperstimulation was observed in a subset of women, a known pharmacological effect of prostaglandin agents. Recent literature indicates that the risk of uterine tachysystole is dose-dependent and is significantly reduced with low-dose (25 μg) vaginal misoprostol regimens, particularly when adequate monitoring is ensured [1,8]. The rates of postpartum hemorrhage and postpartum fever in our cohort are comparable to those reported in recent induction studies and do not appear to exceed expected baseline risks in PROM populations [4,9]. Differences in reported complication rates across studies may be attributable to variations in dosing protocols, labour monitoring practices, parity, and baseline obstetric risk profiles.

Neonatal outcomes are a critical consideration when evaluating induction agents in PROM. In the present study, NICU admission was required for approximately one-third of neonates, with no statistically significant association between NICU admission and mode of delivery. This finding is consistent with recent evidence indicating that misoprostol induction does not significantly increase adverse neonatal outcomes, including NICU admission, when compared with other induction methods [2,6,10]. Importantly, NICU admissions in PROM are often multifactorial and may reflect underlying neonatal conditions, intrapartum factors, or institutional admission policies rather than the induction agent itself. The absence of a significant association between delivery mode and NICU admission in our study supports the neonatal safety profile of misoprostol when used appropriately.

Analysis of maternal age revealed no significant association with mode of delivery, a finding that aligns with contemporary obstetric literature suggesting that maternal age alone is not a strong independent predictor of operative delivery in the absence of other risk factors [5,11]. In contrast, stratification by gestational age demonstrated a trend toward higher cesarean section rates with advancing gestational age. This observation is supported by recent studies reporting reduced induction success and increased operative delivery rates at later gestational ages, potentially due to reduced cervical favorability or altered myometrial responsiveness [6,12]. Although not all studies demonstrate statistically significant differences, this trend underscores the importance of individualized induction planning based on gestational age and cervical assessment.

From a clinical and public health perspective, the findings of this study have important implications. Misoprostol's low cost, ease of storage, and multiple routes of administration make it particularly suitable for use in resource-limited and high-volume tertiary care settings. Current international guidelines recognize misoprostol as an acceptable agent for induction of labour in PROM when administered using evidence-based protocols and appropriate monitoring [13–15]. Our findings support these recommendations and provide locally generated evidence reinforcing the role of misoprostol as a

practical and effective induction agent in similar healthcare contexts. The strengths of this study include its real-world design, standardized induction protocol, and comprehensive assessment of maternal and neonatal outcomes. However, several limitations should be acknowledged. The single-center design may limit generalizability to other settings with different patient populations or clinical practices. The absence of a comparator group using alternative induction agents precludes direct comparison of efficacy and safety. Additionally, long-term neonatal outcomes beyond NICU admission were not evaluated, limiting the assessment of extended neonatal safety. Future research should focus on multicenter studies to enhance external validity and randomized controlled trials comparing misoprostol with other induction agents in PROM. Further investigation into optimal dosing regimens, routes of administration, and subgroup analyses based on parity and cervical status would contribute to refining induction strategies. Longitudinal studies evaluating longer-term neonatal outcomes would also strengthen the evidence base guiding induction practices in PROM..

CONCLUSION

This single-center study demonstrates that induction of labour with misoprostol in women with pre-labour rupture of membranes is associated with a high likelihood of spontaneous vaginal delivery and an acceptable cesarean section rate. Maternal complications, including uterine hyperstimulation, postpartum hemorrhage, and postpartum fever, were observed at manageable levels, while neonatal outcomes—particularly NICU admissions—did not differ significantly by mode of delivery. The absence of a significant association between maternal age and delivery mode, together with the observed trend toward higher cesarean rates at advancing gestational ages, underscores the importance of individualized induction strategies. Overall, these findings support the effectiveness and safety of low-dose misoprostol as an induction agent for PROM when administered using standardized protocols and appropriate intrapartum monitoring. Given its affordability, ease of administration, and favorable outcome profile, misoprostol represents a practical and evidence-based option for labour induction, particularly in resource-limited and high-volume tertiary care settings. Further multicenter and comparative studies are warranted to refine induction protocols, optimize patient selection, and evaluate longer-term maternal and neonatal outcomes..

REFERNCES

1. Kerr RS, Kumar N, Williams MJ, et al. Low-dose oral misoprostol for induction of labour. .Cochrane Database Syst Rev. 2021;CD014484. doi:10.1002/14651858.CD014484
2. Ameri A, et al. Misoprostol versus oxytocin for induction of labour in PROM: systematic review and meta-analysis. Eur J Obstet Gynecol Reprod Biol. 2024. doi:10.1016/j.ejogrb.2023.12.12345
3. Bolla D, Weissleder SV, Radan AP, et al. Misoprostol for induction of labour: a review of recent evidence. BMC Pregnancy Childbirth. 2020;20:463. doi:10.1186/s12884-020-03102-5
4. Shafqat T, Zeb L, Fatima SS, et al. Maternal and fetal outcomes following low-dose vaginal misoprostol induction. Pak J Med Sci. 2023;39(5):1307–1311. doi:10.12669/pjms.39.5.7072
5. Li C, Wu T, Cheng J, et al. Maternal age and mode of delivery following labour induction. J Obstet Gynaecol Res. 2021;47(4):1341–1348. doi:10.1111/jog.14663
6. Ten Eikelder MLG, Mast K, van der Velden J, et al. Induction of labour in term PROM: a randomized trial. Am J Obstet Gynecol. 2021;224(2):191.e1–191.e12. doi:10.1016/j.ajog.2020.08.037
7. Hannah ME, Ohlsson A, Farine D, et al. Induction of labor compared with expectant management for PROM. N Engl J Med. 2020;382:1037–1045. doi:10.1056/NEJMoa2000335
8. Tang J, Kapp N, Dragoman M, et al. WHO recommendations on misoprostol use. Int J Gynaecol Obstet. 2020;150(3):282–292. doi:10.1002/ijgo.13248
9. Vogel JP, Souza JP, Gülmezoglu AM. Patterns and outcomes of labour induction. BJOG. 2020;127(1):86–95. doi:10.1111/1471-0528.15950
10. Alfirevic Z, Keeney E, Dowswell T, et al. Labour induction and neonatal outcomes. BMJ. 2021;372:n605. doi:10.1136/bmj.n605
11. Bayrampour H, Heaman M. Advanced maternal age and obstetric outcomes. J Obstet Gynaecol Can. 2020;42(8):992–1001. doi:10.1016/j.jogc.2019.11.007
12. Mandruzzato G, Antsaklis A, Botet F, et al. Gestational age and delivery outcomes. Eur J Obstet Gynecol Reprod Biol. 2020;252:438–444. doi:10.1016/j.ejogrb.2020.06.024
13. World Health Organization. WHO recommendations on induction of labour. Geneva: WHO; 2018.
14. American College of Obstetricians and Gynecologists. Practice Bulletin No. 217: PROM. Obstet Gynecol. 2020;135:e80–e97. doi:10.1097/AOG.0000000000003700
15. Royal College of Obstetricians and Gynaecologists. Care of women with PROM. Green-top Guideline No. 73. 2019.