

Comparative Analysis of Oral Misoprostol and Vaginal Misoprostol for Induction of Labour

Sehrish Razzaq, Nadia Zahid, Gulfreem Jalil, Amna Aslam
Avicenna Medical College, Lahore.

Abstract

Background: Misoprostol has become an invaluable tool in cervical ripening and induction of labour. Various dosages, routes, and frequencies of administration are under optimization. Current Study was designed to compare the efficacy and safety of oral versus vaginal misoprostol for induction of labour among pregnant women.

Objective: The research aimed to evaluate the effectiveness and safety of vaginal misoprostol vs oral misoprostol in terms of labour induction and maternal and fetal outcomes.

Methods: This cross sectional comparative study was conducted at Avicenna Medical College, Lahore, Pakistan from December 2024 to June 2025. A total of 200 term pregnant women with a Bishop score of ≤ 5 were randomly assigned to receive 50 μ g misoprostol in five instances every 4-6 hours. Oxytocin augmentation was used to receive enough uterine contractions after the dosage limit. The key outcomes were the induction to delivery interval and the rate of vaginal delivery over 24 hours.

Results Primigravida women predominated in both groups with no significant difference between vaginal and oral misoprostol (G1: 62 vs 64; G2: 34 vs 36; G3: 4 vs 0; $p=0.74, 0.73, 0.12$, respectively). Low Apgar scores were observed in 24/74 (32.4%) neonates in the vaginal group and 14/86 (16.3%) in the oral group, while meconium-stained liquor occurred in 20/78 (25.6%) and 14/86 (16.3%) cases, respectively. Maternal adverse events were minimal, with hyperstimulation noted only in the vaginal group (1 case), whereas nausea and hyperpyrexia were more frequent in the oral group. No neonatal mortality was observed in either group.

Conclusion: Vaginal misoprostol appears to be a little better than vaginal misoprostol in terms of causing labour.

Key words: Vaginal misoprostol, oral misoprostol, labour, obstetric outcome.

Introduction

The induction of labour (IOL) is a widespread obstetric practice that is done when the advantages of delivery prevail over the dangers of expectant management.¹ Among the indicators, there are post-term pregnancy, hypertensive disorders, fetal growth restriction, and maternal medical comorbidities; the percentage of all births initiated by induction is increasing globally, as

evidence in support of elective and indicated induction has built up.²

Misoprostol (a prostaglandin E1 analogue) is a commonly utilized choice of cervical ripening and induction of labour due to its uterotonic effect, low cost, room temperature stability, and various routes of administration (oral, vaginal, sublingual, buccal).³ The absorption and excretion rate of the drug also affect the onset and the duration of action: oral misoprostol is absorbed and excreted comparatively faster (half-life of plasma 2-3 hours) to generate a faster but shorter systemic exposure, where vaginal misoprostol exerts more persistent local uterine actions and a longer effect.⁴ The basis of these pharmacokinetic differences is the widely practiced regimens of both oral and vaginal dosing on shorter and longer intervals, respectively.

Systematic reviews and guideline statements increasingly support the use of low-dose oral misoprostol for IOL because it is effective and, when used in low doses and appropriate protocols, may have a favorable safety profile with lower rates of uterine hyperstimulation compared with some

Corresponding Author:

Sehrish Razzaq

Avicenna Medical College
Lahore.

Email: tahirgujjar94@gmail.com

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Authors Contribution

SR & NZ conceptualized the project did the literature search, drafting, revision & writing of manuscript. SR, NZ, GJ & AA did the data collection. SR also performed the statistical analysis.

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higher-dose regimens.⁵ However, vaginal misoprostol remains widely used and is often considered more efficacious at single doses because of sustained local delivery; the trade-offs between speed of induction, cesarean delivery rate, uterine tachysystole/ hyperstimulation, and fetal/neonatal outcomes have been variably reported, and optimal regimens may differ depending on setting, monitoring capacity, and patient risk factors.⁶

Because regimen-specific differences (oral 2-hourly vs vaginal 4-hourly) affect monitoring needs (for example, more frequent fetal surveillance with rapidly absorbed oral regimens) and resource use, direct comparative studies are needed to inform context-appropriate guidelines. The objective of this study is to compare obstetric outcomes, such as induction-to-delivery interval, or rate of vaginal birth in the 24 hours, cesarean delivery, uterine hyperstimulation/ tachysystole, and neonatal outcomes in a low-dose after every 4 hours.⁷ The results will assist clinicians in choosing the safest, most effective, and logistically possible regimen of misoprostol to induce labour in their practice facilities.

Methods

This cross sectional comparative study was conducted at Avicenna Medical College, Lahore, Pakistan from December 2024 to June 2025.

The procedures were carried out according to already established studies demonstrating their safety and efficacy for labour induction⁷⁻⁸ all the details were explained to the expectant mothers, who were in labour due to medical and obstetric reasons, and only those who were interested in participating in the study were selected after all. Pregnancies with singleton pregnancies in cephalic presentation with parity 1-4, clinically adequate pelvis, Bishop's score less than five, pregnancy with high bp, pre-eclampsia, eclampsia, and post-term pregnancy, fetal suffering due to lack of amniotic fluid. Patients with severe health issues such as uncontrolled diabetes, heart, kidney, and liver diseases, and those with hypersensitivity to misoprostol or prostaglandin analogs, or contraindications to labour induction and vaginal delivery.

The sample size was calculated using proportions of successful vaginal delivery in the vaginal and oral misoprostol groups reported in previous studies, assuming a 20% difference between the groups, with a 95% confidence level and 80% power. After accounting for potential non-response or dropouts, a total sample size of 200

participants was considered adequate, with 100 women in each group.⁸

Group I: Vaginal misoprostol - 100 women. One tablet of 50 micrograms of misoprostol was placed in the vagina. The dose was repeated every four hours, up to a maximum of four times.

Group II: Oral misoprostol - 100 women. One tablet of 50 micrograms of misoprostol was taken by mouth. The dose was repeated every four hours, up to a maximum of four times.

Doses were given again until the patient had effective uterine contractions (more than 3 contractions in 10 min.), the cervix was dilated to 3 centimeters, and the bishop's score was 8 or higher. During this time, the doctors watched the uterine contractions and the baby's heart rate. A check was done vaginally four hours and eight hours after the medicine was given, or earlier if the patient had vaginal discharge or started having labour pains. The membranes were broken when the cervix was fully effaced and dilated to 3 centimeters or more. If there were not enough contractions during active labour, oxytocin was started 6 hours after the last dose of the drug. The mother's heart rate, blood pressure, and the baby's heart rate were checked every 30 minutes from the time labour started. The progress of labour was tracked using a portogram, which records the strength and length of contractions, how far the baby has descended, and the dilation and effacement of the cervix.

Hyperstimulation can happen when there are more than five contractions in 10 minutes for two consecutive periods, and the baby's heart rate is not normal. This can be treated by stopping the medicine or giving tocolytics like terbutaline 0.25mg, either through a shot or intravenously, mixed in 5ml normal saline over 5 minutes. Tachysystole is when there are more than five contractions in 10 minutes for two consecutive periods, but the baby's heart rate remains normal. Hypersystole is when one contraction lasts longer than 90 seconds.

Maternal pulse rate, BP, time & the frequency of uterine contractions were observed during the whole labour process.. If after the administration of four doses and 12 hr of induction, the bishop's score is <8, the induction was considered a failure.

Statistical analysis was performed using Graph Pad Prism 8. Categorical variables were expressed as counts (n) and compared between the Vaginal and Oral groups using Chi-square or/and Fisher's exact test, as appropriate. Significance for induction indications was shown on graphs as * $p \leq 0.05$, with $p \leq 0.05$ considered significant.

Results

The gravida-wise distribution of participants demonstrated that primigravida women constituted the majority in both study groups. In the vaginal group, 62 women were primigravida, followed by 34 women in gravida 2, and 4 women in gravida 3. A similar trend was observed in the oral group, where 64 participants were primigravida, and 36 were gravida 2, while no participant belonged to gravida 3. Overall, both groups showed a predominance of primigravida patients, with a gradual decline in frequency as the gravida number increased (Table-1).

Table 1: Gravida wise distribution.

Gravida	Vaginal] (n=100)	Oral (n=100)	p Value (Chi-square)
Primigravida (G ₁)	62	64	0.74
Gravida 2 (G ₂)	34	36	0.73
Gravida 3 (G ₃)	4	0	0.12

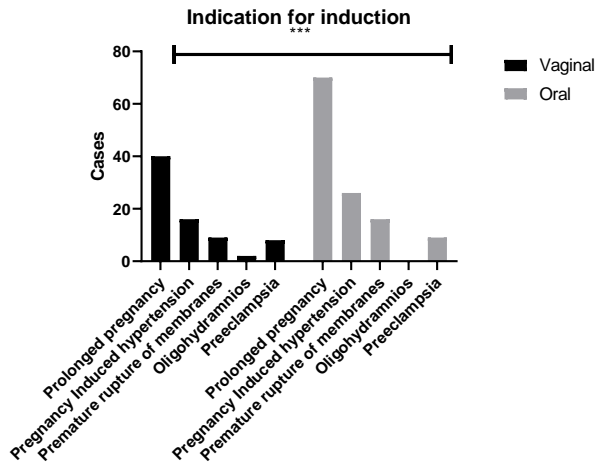


Figure 1: shows the indication for induction in Vaginal vs oral cases. There was a significant difference between prolonged pregnancy in oral vs vaginal cases. * showing the significant difference between the groups. $p \leq 0.05$ was considered significant.**

The indications for labour induction showed notable variation between the vaginal and oral groups. In the vaginal group, the most frequent indication was prolonged pregnancy, accounting for 40 (40%) cases, followed by pregnancy-induced hypertension (PIH) with 16 (16%) cases. Premature rupture of membranes (PROM) was reported in 9 (9%) women, while oligohydramnios and preeclampsia were less common, observed in 2 (2%) and 8 (8%) women, respectively. In the oral group, prolonged pregnancy was also the most

common reason for induction, with 70 (70%) cases, markedly higher than in the vaginal group. This was followed by 26 (26%) cases of PIH and 16 (16%) cases of PROM. Preeclampsia was identified in 9 (9%) patients, whereas no cases of oligohydramnios 0 (0%) were reported in this group. Overall, prolonged pregnancy emerged as the leading indication for induction in both groups, with a substantially higher frequency in the oral group (Figure-1).

Figure-2 displays the number of patients who were delivered by the vaginal and oral route and the number of doses needed to induce. More patients were delivered at dose 2 of the vagina case instead of oral. There was a significant difference between dose 2, while there was not as much difference between doses 3 and 4, which does not indicate a significant difference between the number of patients who delivered vaginally and the number of doses needed.

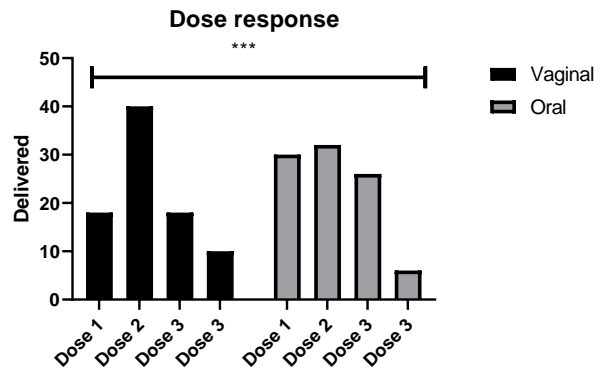


Figure 2: Shows the dose response in the vaginal vs oral group. There was a statistically significant difference between dose 2 of the vaginal group vs the oral group. $p \leq 0.05$ was considered significant.

Table 2: Comparison of complication between Vaginal and Oral Induction Methods. N=200

All Complications	Vaginal (n=100)	Oral (n=100)	P value
Low APGAR scores	14	24	0.12*
Meconium aspiration	13	21	0.15*
Hyperstimulation	1	0	1.00**
Hyperpyrexia	0	3	0.24**
Nausea	0	3	0.24**

*Chi-Square test, **Fisher exact t-test

In group 1, low Apgar scores between 6 and 8 were found in 24 out of 74 babies, and in group 2, 20 out of 78 babies had a meconium-stained liquor. In group 2, 14/86 babies had low Apgar scores, and 14/86 babies had meconium-stained liquor. Group 1

had one instance of hyperstimulation, whereas group 2 had none. Group 2 had more nausea and hyperpyrexia. No incidences of neonatal mortality were recorded in both groups (Table-2).

Discussion

The Misoprostol is now approved as a treatment for peptic ulcers. Initial studies indicated that misoprostol could assist in the induction of contractions in the uterus, and this administration method was working effectively. First and second trimester pregnancies were also terminated using it.⁹ South America was the location of the first studies that attempted to test the use of misoprostol in the process of softening and opening the cervix. Subsequent research established misoprostol as a vaginal application as effective as other popular induction drugs such as prostaglandins and oxytocin.¹⁰ The interval between the doses of misoprostol in the research has been fluctuating between 3 and 6 hours. But due to the possibility of excessively strong contractions, most of the studies adopted a schedule of 4 to 6 hours. This research adhered to the same timetable. Majeed et al. (2025)¹¹ considered the use of oral misoprostol to prepare the cervix in those women who had ruptured membranes before the onset of labour, and they discovered that oral misoprostol was an effective intervention.

Group administered vaginal over oral misoprostol experienced a shorter period with onset of the induction and delivery period, 12.92 hours, compared to 14.04 hours. The findings of this research on vaginal misoprostol were comparable to those of another study.

The vaginal group had a success rate of 94 percent of vaginal delivery compared to 86 percent of the oral group. In the vaginal group, the failure rate was 6%, and in the oral group was 14%. The findings are similar to those who reported the success rate as 86% in the vaginal group and 70% in the oral group,¹² with the failure rates of 14% and 30%, respectively. They are also in tandem with the results of,¹³ in which the success rate of the vaginal group was 70, and that of the oral group was 66, with a failure rate of 30 and 34, respectively. The findings also coincide with those of Wilson et al. (2021)¹⁴ who reported that vaginal deliveries were more successful in the vaginal group. In another study,¹³ the success rate of the oral group and the vaginal group achieved 56.6% and 86.6%, respectively, and failure rates of 26.6 and 13.3, respectively. Research works such as¹⁵ and others have found that vaginal births succeed better among the vaginal group compared to the oral

group. In this case study, the vaginal delivery success rate was 94 percent in the vaginal group. The caesarean section rate in this study was 6 per cent in the vaginal group and 14 per cent in the oral group. These results are comparable to,¹⁶ in which the rate of operative delivery was 14 percent and 30 percent in vaginal and oral groups, respectively. Fetal distress was the greatest cause of operative births in both groups. The reason given in the vaginal group was fetal distress 57% and in the oral group, it was 50%. Preeclampsia and a long pregnancy period, probably as a result of placental insufficiency and umbilical cord compression by low amniotic fluid, were the primary causes of fetal distress in both groups.

These findings are consistent with,¹⁷ in which the vaginal and oral group had 34 and 30 percent operative delivery rate, respectively. The instrumentation mode of delivery was equivalent between the two groups in this study. The reason why the number of failed inductions was higher in the vaginal group (6 percent) than in the oral group (2 percent) was seen in this study. This is consistent with,¹⁸ in which the failure rate of induction was 8 percent in vaginal and 6 percent in oral. The vaginal group had a rate of hyperstimulation of 1%, and caesarean section was done immediately, whereas in the oral group, the rate was zero. The vaginal group was hyper stimulated as a result of increased bioavailability. These findings are comparable to another study, in which the rate of hyperstimulation in the vaginal group was 4%. The findings are also consistent with,¹⁷ where they stated that the rate of hyperstimulation among the vaginal group was 1%. The oral group experienced more gastrointestinal side effects, and hyperpyrexia was also more prevalent in the oral group. In this case, 24 of 74 females on vaginal and 14 of 86 females in oral had low 5-minute Apgar scores of 6-8. Neonatal deaths in both groups were based on no one. In both groups, prolonged pregnancies caused the low Apgar scores at 5 minutes, which was the cause of 39%. This was attributed to compression of the umbilical cord, which occurred due to oligohydramnios and placental insufficiency brought about by placental aging.¹⁹ Two infants were discharged after two days in NICU. In general, the results of neonatal outcomes were favorable in both groups. According to Tarimo et al. 2022,²⁰ there were 100% and 96%, respectively in the oral and vaginal groups of 5-minute Apgar scores above 6. More women in the vaginal group in this study had meconium-stained liquor (20/78) than the oral group (14/86), although this was not significant. Prolonged pregnancy was the major cause of this in both groups. As far as the type of liquor is concerned, the

group that was orally induced with misoprostol had more women with clear liquor (44 out of 50, that is 88, meaning 880) as compared to the group that was vaginally induced (20 out of 50, that is 40, meaning 400). Vaginal misoprostol consisted of a greater number of MSL in all the studies. This was 16.7: 5.9 percent, according to Ramadan et al. 2024.²¹ Greater meconium-stained liquor in the vaginally induced group was attributed to the fact that vaginally absorbed misoprostol avoids the hepatic and gastrointestinal metabolism and hence, a greater concentration in the plasma is reached due to the cumulative effect, with repeated treatment of the drug.²²

Current Study was conducted at a single centre with a relatively small sample size, which may limit the generalizability of the findings and the statistical power to detect differences between groups. The cross-sectional design restricts the ability to establish causality. In addition, participant selection was based on eligibility and willingness, which may introduce selection bias. Furthermore, potential confounding factors could not be fully controlled, which may have influenced the observed outcomes.

Conclusion

The study assessed the effectiveness and safety of different routes of misoprostol administration for labour induction. Based on the findings, vaginal misoprostol appears to be an effective option for induction because of better results compared to oral misoprostol. Although there was no significant difference between the groups, minor numerical variations were noted in some maternal and neonatal outcomes. Future work on labour induction should focus on multi centered study with large population, and long-term follow-up of both mothers and newborns is important to detect any uncommon but serious adverse effects.

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Availability of Data: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethical Approval: The Institutional Review and Ethics Board of Avicenna Medical College, Lahore approved the study via letter no. IRB-60/13/24/AVC dated 28/11/2024.

Conflict of Interest: None declared.

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