Original Article

A Comparative Study of Labor Outcomes after Induction with Oxytocin and Oral Misoprostol in Pregnant Women with Premature Rupture of Membrane

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Received: 11-02-2023; **Revised:** 20-04-2023; **Accepted:** 28-04-2023; **Published on:** 15-05-2023.

ABSTRACT

Introduction: In term women with PROM, oxytocin, and prostaglandins both work well to induce birth. 5 The decision to use a standard procedure is still debatable. The approach that is typically used is oxytocin. However, it must be given intravenously while the infusion and contraction rates are carefully observed. The benefit of misoprostol taken orally, specifically in relation to pre-labor membrane rupture, is the avoidance of repeated vaginal inspections, which lowers the risk of sepsis for both the mother and the infant.

Aims/ objective: To compare the efficacy and safety of oral misoprostol and intravenous oxytocin for induction of labor in women with PROM.

Materials and Method: Women who were diagnosed with PROM were included in the study with 48 women in each group. In the misoprostol group, patients were given 50 micrograms of oral misoprostol every 4 hours until the delivery. Patients enrolled in the oxytocin group were given intravenous infusion of low dose regimen of oxytocin at dose rate of 1 to 2mU/min and the rate was increased incrementally by 1 to 2 mU at 30 mins interval to attain the goal of moderate to strong contractions The time between induction and delivery time was recorded. Any maternal complications were recorded. Neonatal outcomes were also assessed.

Results: Time between induction and delivery was lower in women who were given oral misoprostol and the difference was statistically significant ($p<0.05$). Incidence of caesarean delivery was slightly less in misoprostol group but the difference was not statistically significant ($p >0.05$). Incidence of post-partum haemorrhage, cervical tear or perineal tear was less than 10%. Both the groups were similar with respect to maternal and neonatal complications ($p>0.05$).

Conclusion: In case of premature rupture of membranes, oral misoprostol can be used successfully as an alternative to oxytocin infusion or prostaglandin vaginal pessaries/gel to induce labor. It may also lower postpartum morbidity and shorten hospital stays.

Keywords: Premature rupture of membranes, Oral Misoprostol, Oxytocin, Labor induction.

QUICK RESPONSE CODE →

DOI: 10.47583/ijpsrr.2023.v80i01.016

DOI link: http://dx.doi.org/10.47583/ijpsrr.2023.v80i01.016

INTRODUCTION

Premature rupture of membranes (PROM) is characterised as membrane rupture before the start of labor. Preterm PROM is the term used when it arises prior to 37 weeks of gestation. In 2 to 20% of deliveries, PROM occurs. [1] Just after the membranes have ruptured, labor may start. Yet, if labor is postponed, the foetus is at considerable danger for infection and its associated problems. [2] Frequent vaginal exams increase the risk of infections in both the mother and the foetus. [3] Due to this, postpartum mother and foetal morbidity and mortality have increased. Moreover, a long labor impacts the satisfaction of the mother. Hence, in situations when spontaneous labor does not start at the time of presentation, the American College of Obstetricians and Gynaecologists (ACOG) advises labor induction. [4] It makes 5 to 10% of pregnancies more difficult. [5] At least 60% of PROM cases happen after 37 weeks.

In term women with PROM, oxytocin and prostaglandins both work well to induce birth. [5] The decision to use a standard procedure is still debatable. The approach that is typically used is oxytocin. [6] However, because an immature cervix prevents its use, its effectiveness is dependent on the state of the cervix. Also, it must be given intravenously while the infusion and contraction rates are carefully observed.

Oral misoprostol has been used in studies to treat PROM in women.[7-9] The likelihood of a failed induction and subsequent caesarean birth increases by 30 to 40% if intravenous oxytocin drip induction is attempted in women with an unfavourable cervix, and prolonged labor

raises the risk of infection for both the mother and the new-born. [5]

A special prostaglandin E1 analogue that is quickly absorbed orally is misoprostol. Drug-induced gastric ulceration is treated with reliable, affordable misoprostol tablets. By attaching to prostanoid receptors in the myometrium, it affects the myometrium. The medication does not need to be refrigerated before use. It comes packaged in blisters. [10] It is perfect for use in third-world nations thanks to these features. The vaginal route has been used in the majority of trials, likely because it has been the most effective for other prostaglandins and because misoprostol has a much longer half-life when given vaginally than when taken orally. [11]

Yet, due to a reduced risk of uterine hyperstimulation and less tachysystole, the oral misoprostol's short half-life may be advantageous in labor induction. The benefit of misoprostol taken orally, specifically in relation to pre-labor membrane rupture, is the avoidance of repeated vaginal inspections, which lowers the risk of sepsis for both the mother and the infant. [12] 50 to 100 micrograms of oral misoprostol are administered every 4 to 6 hours for labor induction.

An oral misoprostol dose of 100 micrograms or more for labor induction has been shown to be effective, resulting in more successful vaginal deliveries within 24 hours, according to a meta-analysis of the Cochrane library. However, labor should be closely monitored for uterine hyperstimulation. [13] In order to compare the effectiveness and safety of oral misoprostol and intravenous oxytocin for inducing labor in women with PROM, this research was conducted. The induction to delivery interval, operative birth rates, and neonatal and maternal outcomes were among the outcome variables examined.

MATERIALS AND METHODS

This was a retrospective, record based study conducted in Department of Obstetrics and Gynaecology in tertiary care centre of eastern India. The study was done under the guidelines of good clinical practice and declaration of Helsinki. If the following inclusion and exclusion criteria were satisfied, women with PROM who had been admitted to the Obstetrics and Gynaecology in-patient department within the previous year were included in the research.:

Inclusion Criteria:

- Singleton pregnancy
- Vertex presentation of the foetus
- Term pregnancy of 37 weeks or above
- Women having no evidence of active labor
- Normal pattern of foetal heart rate (FHR)
- Modified Bishop score before induction < 6

Exclusion criteria:

- Previous history of lower section caesarean section (LSCS) or presence of any uterine scar
- Gestational age < 37 weeks
- Malpresentation at the time of admission
- Antepartum haemorrhage in the current pregnancy
- History of chorioamnionitis
- Contraindications to prostaglandin use (bronchial asthma, cardiac disease)
- Presence of Meconium stained liquor
- Placenta praevia detected in current pregnancy
- Presence of significant foetal heart rate decelerations (lowering of FHR below the baseline by greater than 15 beats and lasting for greater than 15 seconds)
- Any other contraindication for normal vaginal delivery such as cephalo-pelvic disproportion, history of cervical cancer or active genital herpes, history of pelvic surgeries or bad obstetric history

Considering power of the study as 85% and significance level of 0.05, the sample size was calculated to be 48 in each group (Misoprostol and Oxytocin groups). A total of 96 consecutive patients admitted in period of three months who were diagnosed with PROM and have met our eligibility criteria, were enrolled in the study. Consecutive patients were enrolled in each group until the predetermined desired sample size was obtained.

All the included patients were given prophylactic antibiotics for the prevention of infection. A routine per vaginal examination was done for evaluation of station and presentation of foetus. The modified Bishop score before induction of labor was evaluated based on cervical dilatation, cervical length, station, consistency, and position. [14]

In the misoprostol group, all the enrolled patients were given 50 micrograms of oral misoprostol every 4 hours until the delivery. The maximum dose was limited to 200 micrograms.

Patients enrolled in the oxytocin group were given intravenous infusion of low dose regimen of oxytocin at dose rate of 1 to 2mU/min and the rate was increased incrementally by 1 to 2 mU at 30 mins interval to attain the goal of moderate to strong contractions defined by maximum 5 contractions in 10 minutes with upper limit set at 40mU/min.

Close monitoring of the foetal and maternal status was done after admitting the patient in the labor room. Uterine contractions and foetal heart rate was continuously monitored by cardiotocography. Progress of labor was assessed by partogram. Induction of labor was labelled as

failed if the modified Bishop score was found to be <5 or no uterine contraction was detected after 4 hours of last dose in the misoprostol group or if there was a failure to achieve active phase of labor within 12 hours of starting the oxytocin infusion. Such patients were transferred for caesarean section. The time between induction and delivery time was recorded. Any maternal complications were recorded. Neonatal outcomes were also assessed.

Statistical analysis: The data was presented in tabular form using Microsoft Excel 365. The categorical were presented as number of cases and percentages and the continuous variables were expressed in form of mean and standard deviation (SD). Unpaired t test was done to evaluate statistical significance of differences in continuous data while fisher's exact test was done to evaluate statistical significance of differences in categorical data. P value of less than 0.05 was taken as a measure of statistical significance.

OBSERVATIONS AND RESULTS

Table 1: Comparison of baseline demographic and clinical characteristics between misoprostol and oxytocin group

Characteristics	Misoprostol Group (n = 48)	Oxytocin Group (n = 48)	P-value (Unpaired t test)
Age in years (Mean ± SD)	28.52 ± 3.09	27.89 ± 2.94	0.31
Body Mass Index in kg/m^2 (Mean ± SD)	24.13 ± 2.38	24.78 ± 2.59	0.20
Period of gestation in days (Mean ± SD)	273.56 ± 5.07	272.23 ± 4.76	0.19
Modified Bishop Score (Mean ± SD)	4.27 ± 0.82	4.19 ± 0.91	
Parity			
0	35	36	>0.99 (Fisher's exact test)
≥ 1	13	12	

There was no statistically significant difference between two groups with respect to age, body mass index (BMI), period of gestation, modified bishop score and parity ($p < 0.05$). Most of the cases were of age group 26-30 years and were primigravidae.

Table 2: Comparison of maternal outcomes between misoprostol and oxytocin group

Outcomes	Misoprostol Group (n = 48)	Oxytocin Group (n = 48)	P-value
Induction to delivery time in minutes	322.04 ± 61.85	359.57 ± 82.73	**0.01** (Unpaired t test)
Mode of delivery			
Vaginal	44	42	0.74
Caesarean	4	6	
Other maternal complications			
Post-partum haemorrhage	2	3	>0.99
Cervical tear	1	2	>0.99
Perineal tear	2	4	0.68

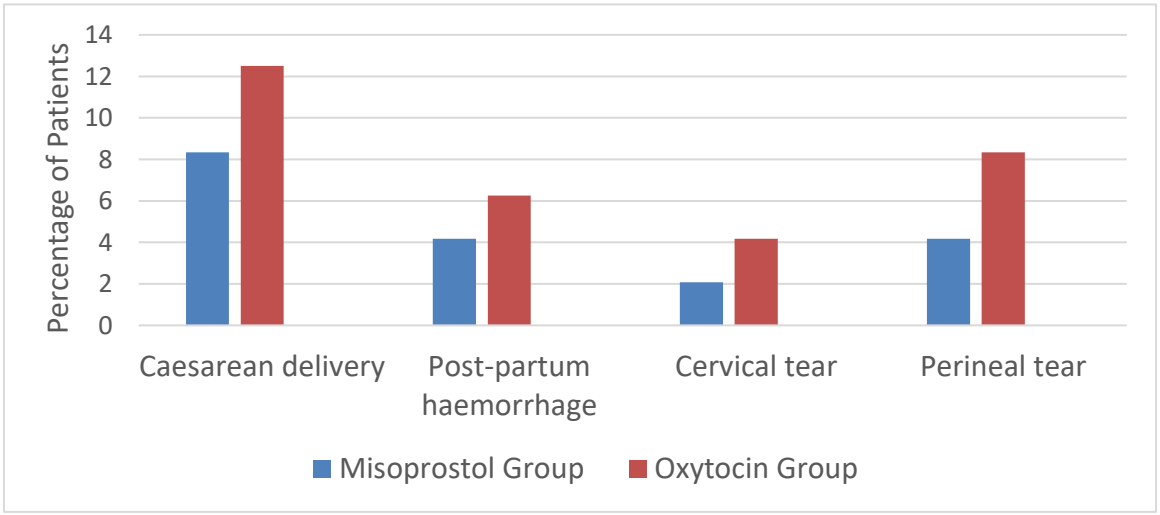

Figure 1: Comparison of adverse maternal outcomes between two groups

Time between induction and delivery was lower in women who were given oral misoprostol and the difference was statistically significant ($p<0.05$). Incidence of caesarean delivery was slightly less in misoprostol group but the difference was not statistically significant ($p >0.05$). Both the groups were similar with respect to other maternal complications ($p>0.05$). Incidence of post-partum haemorrhage, cervical tear or perineal tear was less than 10%.

Table 3: Comparison of neonatal complications between misoprostol and oxytocin group

Outcomes	Misoprostol Group (n = 48)	Oxytocin Group (n = 48)	P-value (Fisher's Exact Test)
Meconium aspiration	2	4	0.68
NICU admission	2	1	>0.99
Neonatal death	0	1	>0.99

Both the groups were similar with respect to neonatal complications ($p>0.05$). Meconium aspiration was diagnosed in only 2 cases in misoprostol group as compared to 4 cases in oxytocin group.

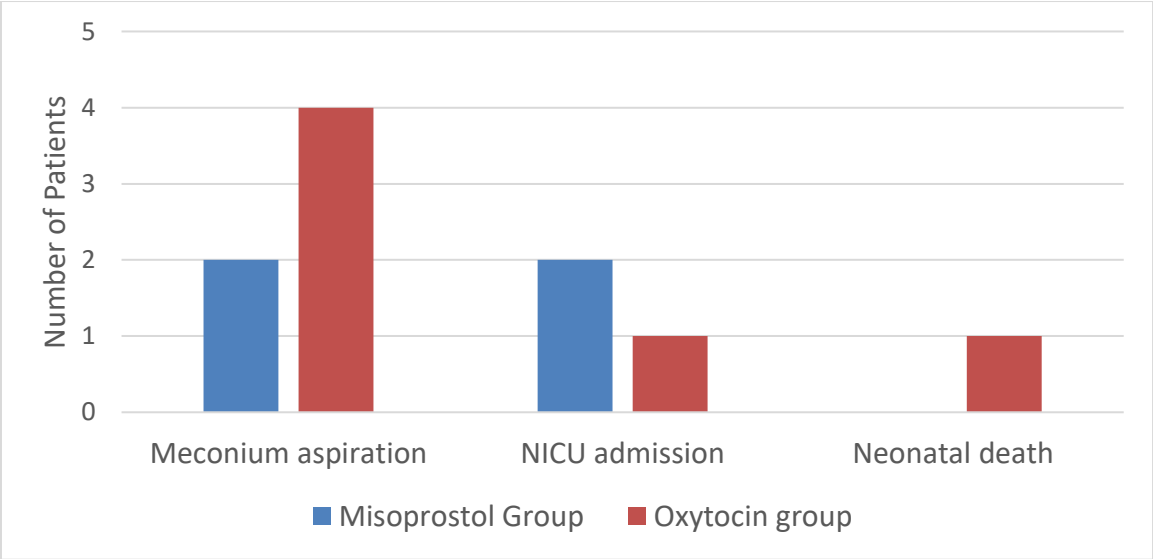

Figure 2: Comparison of adverse maternal outcomes between two groups

DISCUSSION

2 to 20% of all births are complicated by PROM. [6] The likelihood of complications and infections for both the mother and the foetus rises if labor is delayed after PROM. [15] The perfect induction agent is still being sought after. Agents given intravenously, such as oxytocin, require careful monitoring while those given vaginally raise infection rates. As a result, efforts to find a reliable induction drug are still ongoing. Oral misoprostol is one such treatment.

Age and BMI were similar between the misoprostol and oxytocin groups in the current research. The mean age in the research by Shabana A et al. was 27.89 ± 2.94 years for the oxytocin group and 28.52 ± 3.09 years for the misoprostol group. [16] In the research by Rashmi R, Pradhan A, et al., the mean age was 25.19 ± 3.52 years for the misoprostol group and 24.99 ± 3.52 years for the oxytocin group. [17] Additionally, the majority of their patients in both categories belonged to the lower middle class. In the research by Nigam A et al., the mean age was 25.1 ± 2.2 years for the misoprostol group and 25.4 ± 2.9 years for the oxytocin group. [18]

In the current research, the gravida status of the two groups was also comparable. In both categories, the majority of the cases were primigravidae. These findings need to be noted while deriving conclusion from this study. These results contradict those of Rashmi R. and Pradhan A. et al. and Shabana A. et al.[16, 17]

The modified Bishop score and gestational age were also similar between the misoprostol and oxytocin groups. The results of the studies by Shabana A et al. and Rashmi R and Pradhan A et al.[16, 17] were comparable. Furthermore, the mean maternal age was greater than 38 weeks in both groups, according to Shabana A et al. findings.[16] This was very comparable to the current study, where both groups' mean gestational ages were over 270 days.

The most frequent method of delivery was found to be vaginal, with LSCS needed in 8.33% of misoprostol instances and 12.5% of oxytocin cases. Additionally, Shabana A et al. discovered that the majority of instances involved straightforward vaginal deliveries. [16] 12% of oxytocin group cases and 6% of misoprostol group cases needed caeserian. Parallel to this, Rashmi R., Pradhan A., et al. discovered that the majority of patients gave birth vaginally (85.7% in the

misoprostol group as compared to 82.9% in the oxytocin group). [17]

In the current research, the misoprostol group's induction to delivery time (322.04 ± 61.85 minutes) was significantly shorter than that of the oxytocin group (359.57 ± 82.73 minutes; p value 0.01). This was comparable to the research by Shabana A et al., in which the misoprostol group's induction to delivery time was 6.59 ±1.91 hours and the oxytocin group's was 9.30 ± 2.58 hours. [16] In a different research, Rashmi R, Pradhan A, et al. discovered that the misoprostol group's induction to delivery time (5.0 ± 2.58) was significantly shorter than the oxytocin group's (4.33 ± 2.23 hours). [17] Similar results were found in the study by Nigam A et al., where the misoprostol group's induction to vaginal delivery time (7.7 ± 2.8 hours) was considerably less than the oxytocin group's (14.3 ± 4.8 hours). [18] They also noticed that both nulliparous and multiparous patients had a considerably shorter duration.

The amount of blood lost in the current research was comparable between the two groups. No group experienced any intrapartum complications in terms of the maternal outcome. The bulk of the neonates had stable neonatal outcomes. Additionally, it was noted that 1 case in the oxytocin group and 2 cases in the misoprostol group needed NICU admission. Both groups' maternal and neonatal complications were similar to those found in other studies. [13, 19]

In a related research, Al-Hussaini T et al. found that the misoprostol group had significantly more intrapartum complications than the oxytocin group did, including gastrointestinal symptoms and contractile abnormalities. [20] This could be because the research used a higher dose of oral misoprostol: 100 micrograms every six hours (maximum of 200 micrograms).

The time from induction to delivery and the requirement for oxytocin and antibiotics are both substantially decreased when oral misoprostol is administered to women with an unfavourable cervix shortly after term PROM. [7] As a result, patients may not have felt as constrained in the early stages of labor when using oral misoprostol for labor induction, which lowers the frequency of vaginal examinations and uses intravenous lines only in late labor.

Our study had certain limitation. Blinding was not done and women with preterm premature rupture of membrane were not included which can affect the generalisability of our results.

CONCLUSION

According to our research, women who undergo oral misoprostol induction for premature membrane rupture have faster induction to delivery times and have healthy foetuses. In case of premature rupture of membranes, oral misoprostol can be used successfully as an alternative to oxytocin infusion or prostaglandin vaginal pessaries/gel to induce labor. In addition to raising maternal satisfaction levels, it may also lower postpartum morbidity and shorten hospital stays. There needs to be more research done in this area.

Acknowledgement: We are thankful to the healthcare workers of Narayan Medical College & Hospital, Jamuhar, Bihar, India.

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Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.