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Original Research Article

Assessment of Oral Misoprostol versus Oxytocin for Labor Induction in Term Prelabor Rupture of Membranes

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Abstract

Objective: PROM at term is a common complication of pregnancy that can lead to significant perinatal morbidity and mortality, especially when accompanied by a prolonged latency period from membrane rupture to delivery. This study seeks to evaluate and compare the effectiveness and safety of oral misoprostol versus oxytocin infusion for labor induction in women experiencing prelabour rupture of membranes (PROM) at term.

Methods: This prospective randomized trial involved 100 pregnant women admitted to the Department of Obstetrics and Gynecology at Prathima Institute of Medical Sciences, Naganoor, Karimnagar, with the term PROM. Participants were randomly assigned to two equal groups (groups A or B): group A received oral misoprostol at a dosage of 100 μg every 4 hours for a maximum of three doses, while group B received intravenous oxytocin infusion, starting at 4 mU/min with incremental increases of 4 mU/min every 30 minutes up to a maximum dose of 32 mU/min. The primary outcome measure was the time from induction to vaginal delivery, with secondary outcomes including mode of delivery, as well as maternal and neonatal outcomes.

Results: A statistically significant contrast emerged between the two groups regarding the induction-to-delivery interval (IDI), with the mean being notably lower in the misoprostol group compared to the oxytocin group (6.45 ± 1.85 and 9.43 ± 2.19; $P < 0.001$), respectively. Furthermore, a highly significant difference was observed between the study groups concerning the mean IDI in nulliparous and multiparous women.

Conclusion: Administering oral misoprostol at a dosage of 100 μg every 4 hours proved to be not only equally effective as oxytocin for labor induction in term PROM patients but also shortened the duration of labor, particularly in nulliparous women. Moreover, oral misoprostol demonstrated safety in terms of both maternal and neonatal outcomes. Considering these findings, oral misoprostol emerges as a viable alternative to oxytocin for labor induction in term PROM cases.

Keywords: Induction Of Labor, Misoprostol, Oxytocin, Prelabour Rupture of Membranes.

Introduction

Term prelabor rupture of membranes (PROM) stands as one of the most prevalent pregnancy complications, characterized by the rupture of fetal membranes before the onset of labor [1]. This occurrence affects 8-10% of pregnant women at term, and an extended duration between membrane rupture and delivery heightens the likelihood of chorioamnionitis and neonatal sepsis. Managing term patients with PROM, particularly those with an unfavorable cervix, remains a subject of debate, with options ranging from immediate induction of labor to delayed induction or expectant management. Opting for active management results in a shorter interval from PROM to delivery, thereby reducing the risk of postnatal infection. Furthermore, active management tends to be favored by patients [2]. Pharmacologically, oxytocin and prostaglandins are the most commonly employed agents for labor induction [3]. Oxytocin, being the standard agent for labor induction, is primarily synthesized endogenously in the hypothalamus and released from the posterior pituitary gland [4]. While oxytocin infusion is widely recognized as a safe and effective method for labor induction, its success significantly relies on the initial condition of the cervix [3]. Misoprostol, an analog of prostaglandin E1, is rapidly absorbed orally and has demonstrated both safety and efficacy in cervical ripening and labor induction. One of its notable advantages lies in its affordability and stability at room temperature, negating the need for refrigeration during storage, unlike other prostaglandins. These attributes render

it particularly suitable for use in developing countries [5]. The distinct advantage of oral misoprostol in the context of PROM is its ability to obviate repeated vaginal examinations, thereby reducing the risk of sepsis for both the mother and the baby [6].

Material and Methods

This cross-sectional study was conducted on 50 pregnant women admitted to the Department of Obstetrics and Gynecology, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional Ethical approval was obtained for the study after explaining the nature of the study in vernacular language. Written consent was obtained from all the participants of the study.

Inclusion criteria consisted of singleton pregnancies with a gestational age of at least 37 weeks, vertex presentation, absence of active labor, normal fetal heart rate pattern, and a Bishop score of at least 6. Participants were either nulliparous or multiparous (not exceeding para 5). Exclusion criteria included previous uterine scar, chorioamnionitis, contraindications to prostaglandin use (e.g., bronchial asthma, cardiac disorders), thick or dark meconium-stained liquor, placenta previa, active vaginal bleeding, or any condition precluding vaginal delivery. Following confirmation of membrane rupture through a sterile speculum examination, participants underwent obstetric ultrasound assessment to ascertain fetal cardiac activity, gestational age, lie, presentation, and amniotic fluid index (AFI). Participants were then randomly assigned to either Group A or Group B.

Group I received 100 µg oral misoprostol every 4 hours for a maximum of three doses [7]. Group II received intravenous oxytocin infusion, starting at a dose of 4 mU/min (eight drops/min), with an incremental increase of 4 mU/min every 30 minutes. Oxytocin infusion commenced with a solution of 500 ml Ringer's solution containing 5 IU oxytocin/ml, administered at a rate of 4 mU/min (eight drops/min). The dose was titrated every 30 minutes until adequate uterine contractions were achieved (three contractions within 10 minutes lasting 40–60 seconds) or to a maximum of 32 mU/min [8]. Participants admitted to the delivery room underwent continuous monitoring of fetal heart rate and uterine activity, with partogram initiation to monitor labor progress. Induction was ceased in case of fetal or maternal complications, such as fetal distress or failed induction. Patients experiencing hyperstimulation were managed with cessation of oxytocin infusion, intravenous fluids, oxygen supplementation, and position change. Emergency cesarean section was indicated if hyperstimulation persisted and fetal heart rate failed to improve. The primary outcome measure was induction-to-delivery interval (IDI), while secondary outcomes included mode of delivery, maternal side effects (e.g., abnormal uterine activity, nausea, vomiting, pyrexia, postpartum hemorrhage), and secondary fetal outcomes (e.g., Apgar score at 5 minutes, birth weight, NICU admissions).

Statistical Analysis: Data were collected, tabulated, coded, and analyzed using SPSS version 21. Descriptive statistics included mean, standard deviation, range for quantitative variables, frequency (n), and percentage (%) for qualitative variables. Differences between variables were expressed using p-values (<0.05 significant).

Results

A total of 50 cases divided equally between two groups were included in the study. The findings of this study indicated no significant difference between the study groups concerning demographic and antepartum variables. Maternal age, gestational age, parity, duration of prelabour rupture of membranes (PROM), admission temperature, and Bishop score exhibited similarity across both groups, as depicted in Table 1.

Table 1: Demographic profile of patients in Term Prelabour Rupture of Membranes

Variable	Group I Misoprostol (N=25)	Group II Oxytocin (N=25)	P value
Maternal age (years)	25.64 ± 3.06	25.92 ± 2.92	0.957
Gestational age (weeks)	38.25 ± 0.65	38.40 ± 0.70	0.864
Duration of ROM (h)	6.98 ± 1.24	7.81 ± 1.10	0.452
Admission temperature	37.02 ± 1.37	37.16 ± 0.24	0.147
Bishop Score	6.67 ± 0.94	7.09 ± 1.19	0.248

A statistically significant contrast emerged between the two groups regarding the induction-to-delivery interval (IDI), with the mean being notably lower in the misoprostol group compared to the oxytocin group (6.45 ± 1.85 and 9.43 ± 2.19; P < 0.001), respectively. Furthermore, a highly significant difference was observed between the study groups concerning the mean IDI in nulliparous and multiparous women, as outlined in Table 2.

Table 2: showing parameters from Induction to delivery interval according to parity

Variable	Group I Misoprostol (N=25)	Group II Oxytocin (N=25)	P value
Induction to the delivery interval in hours			
Nulliparous	14	15	0.0245
	7.22 ± 1.33	10.96 ± 1.27	0.001
Multiparous	11	10	
	6.54 ± 1.71	6.94 ± 1.06	
Total induction to delivery interval	6.45 ± 1.85	9.43 ± 2.19	0.001

Table 3 shows that there is no significant difference between the misoprostol and oxytocin groups regarding the mode of delivery. Both groups had a similar proportion of patients undergoing spontaneous vaginal delivery (SVD) and cesarean section (CS). The majority of patients in both groups delivered vaginally, with cesarean section rates being relatively low and comparable between the two groups. Therefore, the choice of labor induction agent (misoprostol or oxytocin) did not appear to have a significant impact on the mode of delivery in this study. In the misoprostol group, cesarean section was indicated in two cases (8%) due to fetal distress characterized by fetal tachycardia. Conversely, in the oxytocin group, one case (4%) resulted from fetal distress, one case (4%) from failed induction, and two cases (8%) from inadequate progress.

Table 3 Mode of delivery of the patients in the two groups

Variables	Group I Misoprostol (N=25)	Group II Oxytocin (N=25)	P value
Mode of delivery			
SVD	23 (92%)	21 (84%)	0.554
CS	2 (8%)	4 (16%)	0.245
Total	25 (100%)	25 (100%)	-----

Table 4 presents intrapartum complications observed in two study groups In Group I (Misoprostol), out of the total 25 patients, 22 (88%) experienced no intrapartum complications. One patient (4%) encountered gastrointestinal (GIT) complications and two patients (8%) had hyperstimulation along with fetal distress. In Group II (Oxytocin), out of the total 25 patients, 24 (96%) had no intrapartum complications. There were no cases of GIT complications. One patient (4%) experienced hyperstimulation along with fetal distress. It can be seen that the majority of patients in both groups did not experience intrapartum complications. The incidence of intrapartum complications was relatively low in both groups. Most patients had no complications during labor. The P-value indicates that there is no significant difference between the misoprostol and oxytocin groups in terms of intrapartum complications.

Table 4: Intrapartum complications in the study groups

Variables	Group I Misoprostol (N=25)	Group II Oxytocin (N=25)	P value
Intrapartum complications			
No complications	22(88%)	24(96%)	
GIT complications	1(4%)	0(0.00%)	0.621
Hyper tonus + fetal distress	2(8%)	1(4.0%)	
Total	25 (100%)	25 (100%)	

Table 5 shows that In Group I (Misoprostol), out of the total 25 patients, one patient (4%) had an Apgar score of less than 7 at 5 minutes. The mean birth weight was 3.15 ± 1.41 kg, and one patient (4%) was admitted to the Neonatal Intensive Care Unit (NICU). In Group II (Oxytocin), out of the total 25 patients, two patients (8%) had an Apgar score of less than 7 at 5 minutes. The mean birth weight was 3.19 ± 1.24 kg, and two patients (8%) were admitted to the NICU. It can be interpreted that the majority of patients in both groups did not experience adverse intrapartum outcomes. The incidence of Apgar score less than 7 at 5 minutes and admission to NICU was relatively low in both groups. Additionally, there was no significant difference between the misoprostol and oxytocin groups in terms of Apgar score less than 7 at 5 minutes, birth weight, or admission to NICU, as indicated by the P-values being greater than 0.05. Therefore, the choice of labor induction agent (misoprostol or oxytocin) did not significantly affect these intrapartum outcomes in this study.

Table 5: Intrapartum complications in the study groups

Variables	Group I Misoprostol (N=25)	Group II Oxytocin (N=25)	P value
Apgar Score < 7 at 5 min	1(4%)	2(8%)	0.354
Birth weight/Kg	3.15 ± 1.41	3.19 ± 1.24	0.841
Admission to NICU	1(4%)	2(8%)	0.221

In the misoprostol group, one patient exhibited gastrointestinal tract complications, presenting with symptoms of nausea and vomiting, while no complications were observed in the oxytocin group. one patient (4%) in the misoprostol group experienced uterine hypertonus, and one patient in the oxytocin group also encountered uterine hypertonus, characterized by contractions lasting at least 2 minutes without a normal fetal heart rate. None of the study groups showed cases of chorioamnionitis, with no significant disparity in intrapartum complications observed. In terms of postpartum complications, one patient (4%) in the misoprostol group experienced atonic postpartum hemorrhage, while two patients (8%) in the oxytocin group encountered atonic postpartum hemorrhage, none of whom necessitated blood transfusion.

Discussion

The study revealed a reduction in the time intervals from induction to delivery (IDI) in the misoprostol group compared to the oxytocin group (6.45 ± 1.85 and 9.43 ± 2.19 hours, respectively; $P < 0.001$), and this difference between the two groups was statistically significant. Our findings align with Ngai et al. [7], who observed a significantly longer IDI in the oxytocin group compared to the misoprostol group (11.1 ± 4.9 and 7.3 ± 3.1 hours, respectively). Similarly, Al-Hussaini et al. [8] reported a significantly shorter IDI in the misoprostol group compared to the oxytocin group (5.5 ± 2.9 and 10 ± 4.8 hours, respectively). Additionally, Nigam et al. [9] found a shorter IDI with misoprostol (7.7 ± 2.8 hours) compared to oxytocin (14.3 ± 4.8 hours). However, Mozurkewich et al. [10] reported similar time intervals from IDI: 11.9 hours in the misoprostol group and 11.8 hours in the oxytocin group. Our results contrast with Crane et al. [11], who identified a significant difference between the misoprostol and oxytocin groups, with a longer IDI in the misoprostol group (737 ± 426 minutes) compared to oxytocin (573 ± 318 minutes) ($P < 0.05$). This disparity may be attributed to the higher percentage of nulliparous women in their study's misoprostol group (67.3%) and their utilization of an oral dose of misoprostol (75 μg).

There was no significant contrast observed between the two groups regarding the mode of delivery; specifically, 23 women (92%) in the misoprostol group and 21 women (84%) in the oxytocin group delivered vaginally. The occurrence of cesarean section in the misoprostol group was 6% (three cases), whereas in the oxytocin group, it was 12% (six cases). These findings corroborated with previous studies such as Ngai et al. [7] (5% in the oral misoprostol group and 7.5% in the oxytocin group), Mozurkewich [10] (20.1% in the oral misoprostol group and 19.9% in the oxytocin group), and Butt et al. [12] (14.5% in the oral misoprostol group vs. 13.2% in the oxytocin group). These studies demonstrated a nonsignificant disparity in the mode of delivery between the misoprostol and oxytocin groups. Failed progression in the oxytocin group accounted for the most indications of cesarean section, four cases (16%), with non-occurrence of failed progression in the misoprostol group. In the misoprostol group, there was an occurrence of failed progression, aligning with Tarik [1], who reported that all cesarean sections conducted in the oxytocin group were due to failure to progress (7.4%). However, Butt et al. [12] observed failed progression as the primary indication for cesarean section in both the misoprostol and oxytocin groups, with six cases (10.9%) in the misoprostol group and 11.3% in the oxytocin group. The rate of emergency cesarean section due to fetal distress did not exhibit statistical significance between the two groups, with two cases (4%) in the misoprostol group and one case (2%) in the oxytocin group. Consistently, Mozurkewich [10] found no notable difference in the incidence of fetal distress between the misoprostol and oxytocin groups, with a fetal distress rate of 6.9% in the misoprostol group compared to 2.7% in the oxytocin group. In the misoprostol group, 30 women (60%) required a single dose of misoprostol (100 μg), while the remaining 20 women (40%) necessitated more than one dose. This observation aligns with the findings of Ngai et al. [7], who noted that 60% of women in their study required a single dose of oral misoprostol.

There were no disparities observed between the two groups regarding the incidence of hypertonus, tachysystole, and hyperstimulation, with 4% of women in the misoprostol group and 2% in the oxytocin group experiencing hypertonus. Correspondingly, Crane et al. [11] noted no distinction between the misoprostol and oxytocin groups concerning hypertonus occurrence (6% vs. 4.1%, respectively). This finding was also consistent with Mozurkewich [10], who observed a trend toward a nonsignificant difference in hypertonus occurrence between the misoprostol and oxytocin groups (10.7% vs. 8.8%, respectively). In this study,

there were no instances of tachysystole in either group, which is in line with Rath et al. [9], who reported no occurrences of tachysystole in their investigation. Mozurkewich [10] reported a higher incidence of tachysystole in both the misoprostol and oxytocin groups (10.1% vs. 8.1%, respectively), with a slightly higher incidence in the misoprostol group, although this difference was not statistically significant due to inadequate sample size. No cases of chorioamnionitis were identified in either study group. Several studies have consistently found no significant disparity between the misoprostol and oxytocin groups regarding the occurrence of chorioamnionitis [7,13]. There was no notable distinction detected between the study groups concerning the occurrence of atonic postpartum hemorrhage, with only one case (4%) reported in the misoprostol group and two cases (8%) in the oxytocin group. This finding aligns with the outcomes of Crane et al. [11], who observed a similar lack of significant difference in both the misoprostol and oxytocin groups, with two cases (3.8%) occurring in the misoprostol group out of 52 cases, while no instances of this complication were noted in the oxytocin group. The 5-minute Apgar score, a critical neonatal outcome in labor induction, displayed no noteworthy difference between the study groups. The proportion of infants with an Apgar score below 7 in both the misoprostol and oxytocin groups was 4% and 8%, respectively. These findings corroborate those reported by Crane et al. [11], who similarly found no significant discrepancy between the misoprostol and oxytocin groups in the 5-minute Apgar score (10 for each at 5 minutes). Additionally, Rath and Kabiraj [5] observed no notable difference in the incidence of an Apgar score less than 7 between both groups (6.6% and 6%, respectively).

Conclusion

Administering oral misoprostol at a dosage of 100 µg every 4 hours proved to be not only equally effective as oxytocin for labor induction in term PROM patients but also shortened the duration of labor, particularly in nulliparous women. Moreover, oral misoprostol demonstrated safety in terms of both maternal and neonatal outcomes. Considering these findings, oral misoprostol emerges as a viable alternative to oxytocin for labor induction in term PROM cases, particularly when avoiding repeated vaginal examinations is advisable. Therefore, oral misoprostol remains a viable option for managing term PROM.

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