e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(6); 329-333

Original Research Article

# Comparative Study of Vaginal, Sublingual, and Buccal Misoprostol in Induction of Labor in Term Pregnancy

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**Received: 25-03-2024 / Revised: 23-04-2024 / Accepted: 26-05-2024**

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**Conflict of interest: Nil**

**Abstract:**

**Background:** One typical procedure used when there is a maternal or fetal indication for a pregnancy termination is induction of labor (IOL). Pregnant women are inducing labor in large numbers in both developed and developing nations. This study compared the efficaciousness of sublingual, vaginal, and buccal misoprostol for inducing labor in a full-term pregnancy.

**Methods:** From July 2023 to December 2023, this study was conducted at the SKMCH, Department of Obstetrics and Gynecology in Muzaffarpur, Bihar. A random allocation of 150 subjects was made to receive 50 µg of buccal, 25 µg of vaginal, and 50 µg of sublingual misoprostol. The problems for the mother and fetus, as well as the hour 1 and hour 6 Bishop Scores, were noted.

**Results:** Between the three groups, there were no differences in maternal (P>0.05) or fetal (P>0.05) problems. Additionally, there were no differences between these groups for Bishop score hour 1 (P = 0.146), Bishop score hour 6 (P = 0.704), or total dose (P = 0.15). Based on the buccal, sublingual, and vaginal deliveries that were made in each group, our study identified a difference (P = 0.015) in the three groups' ability to achieve a conventional vaginal birth within a day. Compared to the other groups, the Buccal group used oxytocin at a higher rate (P = 0.022).

**Conclusion:** This study found that while there was no difference in the three groups' rates of fetal and maternal problems, there was a significant difference in the use of oxytocin and vaginal deliveries within 24 hours of the start of induction.

**Keywords:** Buccal, Sublingual, Vaginal, Misoprostol.



## Introduction

One of the most prevalent medical procedures in obstetrics is labor induction. When the woman or fetus is at risk from the pregnancy continuing, the goal is to terminate it. Although prostaglandins come in a variety of forms, the following are the most widely utilized varieties: 1. prostaglandin E1 (misoprostol), used orally, rectally, or vaginally; 2. prostaglandin E2 (dinoprostone), available as a gel or suppository [1].

Prostaglandins are a better method of inducing labor because they have a local effect on the cervix that only causes the cervix to dilate and contract, whereas oxytocin only influences uterine contractions and does not soften the cervix. Misoprostol, also known as prostaglandin E1, has long been recognized as an affordable and efficient treatment for peptic ulcers that can be used to induce delivery. Prostaglandin E1 should be stored at room temperature. Temporary adverse effects from excessive dosages of this medication include fever, nausea, vomiting, and diarrhea [2]. Misoprostol side effects include fever, chills, bradycardia, hyperstimulation of the uterus, and infrequently, rupture of the uterus [3-5]. Misoprostol has a serum peak that appears 34 minutes after use and a half-life of roughly 20–40 minutes; in contrast, the serum peak of vaginal misoprostol appears 60–80 minutes after consumption and lasts for four hours [6].

Vaginal misoprostol is typically given at a dose of 25 mg every four hours [7]. Numerous investigations on the use of sublingual and vaginal misoprostol have revealed that, when given at the same dosage, vaginal misoprostol shortens labor's duration and induces more uterine contractions. The

drug's pharmacokinetic action accounts for the vaginal type's superior potency. Despite claims that the vaginal form of the medication prepares the cervix better, the oral form's shorter half-life makes it more effective at controlling uterine contractions [1,2, 8].

The pharmacokinetics of misoprostol demonstrate its rapid oral absorption and peak serum level after 15 minutes of oral administration (tmax=0.309 μ/L). Oral administration results in a half-life of 20–40 minutes and a minimum level of serum density after 120 minutes. According to certain researchers, the vaginal type's superior efficacy results from the liver effect (first passage effect) not present [6–8].

Previous studies have demonstrated that oral and sublingual misoprostol delivery techniques have higher plasma concentrations than vaginal techniques, and that sublingual techniques induce labor more quickly than other misoprostol administration techniques. Sublingual techniques have a similar effect on cervix preparation as vaginal techniques, but because they do not directly affect the cervix, there is less chance of uterine hyperstimulation. Among the benefits of the sublingual approach are its straightforward prescription, increased patient comfort, and fewer requirements for vaginal examinations [10]. Numerous blood arteries in the buccal region of the mouth facilitate the quick absorption of medications. Although it is incredibly successful, using buccal misoprostol to induce labor makes people more nauseous. More patients are being treated with buccal and sublingual techniques than with vaginal type [11].

The effects of vaginal, sublingual, and buccal techniques on inducing labor in term pregnancies are compared in this study.

**Material and Methods**

From July 2023 to December 2023, the Department of Obstetrics and Gynecology at Sri Krishna Medical College and Hospital in Muzaffarpur, Bihar, conducted this study. After giving their informed consent, all of the patients were added to the research. The following criteria were required for inclusion: an occipital presentation in an induced live single pregnancy; gestational age greater than 37 weeks; Bishop Scores less than five; a reassuring fetal heart rate pattern; a fetus weighing less than four kg; and an amniotic fluid value greater than five.

However, entry into the study was restricted to patients who met the following exclusion criteria: rupture of the membrane, fetal growth restriction, suspected fetal malformations, history of uterine surgery or cesarean section, severe preeclampsia (urine protein more than 300 mg/dl, blood pressure more than 160/100, and abnormal liver tests), parity more than two, presence of uterine contractions, cardiovascular, renal, and liver diseases. All participants were divided into groups A, B, and C based on simple random sampling with random numbers and entered the randomized clinical trial.

At the time of their initial admission, the mother's BMI, primary Bishop Score, and gestational age were noted. Based on the last menstruation date, which the primary sonography confirmed, gestational age was calculated [11]. Every pregnant participant in the study had their fetal heart rate continually recorded one hour prior to the onset of uterine contractions, one hour following the induction of labor, and one hour following the conclusion of the study. It was continuously watched till it was delivered. For a duration of twenty-four hours, the first group was administered 50 mg misoprostol sublingually every six hours, the second group 50 mg misoprostol buccal (between the cheek mucosa and the tooth) every six hours, and the third group 25 mg vaginal misoprostol for inducing labor (without repetition).

In each of the three groups, a proper contraction happens when a uterine contraction lasts for 40 seconds and happens every three to five minutes on average. The oxytocin induction would begin four hours following the final misoprostol tablet. Failure to enter the active phase (regular uterine contractions with a four-centimeter cervical dilation) six hours following the final misoprostol dosage is referred to as fail induction. Patients were recommended a cesarean section in the event of a protracted active phase or a failed induction.

The main outcome was vaginal birth during the first twenty-four hours of the start of labor induction. The rate of cesarean sections, their indication, the time it took to enter the active phase, the amount of misoprostol used overall, the need for oxytocin to induce labor, and fetal complications, such as abnormal heart rate patterns during labor, such as tachycardia, delayed deceleration, severe variable deceleration, prolonged deceleration, or reduced FHR variability, were the secondary results[12]. The questionnaire included information on meconium excretion, the Apgar score at one- and five-minutes following delivery, and the length of stay in the NICU.

Maternal problems were observed and documented for each of the three groups. These included fever, chills, nausea, vomiting, uterine tachysystole, and uterine hyperstimulation. A tachysystole contraction occurs six times per ten minutes. Any contraction lasting longer than two minutes or a type of tachysystole that causes a decrease in heart rate and calls for quick treatment (tocolytic or delivery) are considered hyperstimulation. Four grams of intravenous magnesium sulfate were administered for thirty minutes in the event of hyperstimulation.

SPSS software, version 21 (IBM, USA) was used for data analysis with ANOVA and chi-square tests and the significant level was P<0.05.

## Results

Three equal groups of 150 patients were studied for this investigation. The administration of misoprostol was continued for all three groups until the required delivery, and none of the patients were excluded from the research. Side effects from the drugs did not lead to the cancellation of any surgeries. The findings indicate that there was no significant difference between the three groups for the average age (P = 0.941), body mass index (P = 0.464), total dosage (P = 0.80), Bishop Score in the first hour (p = 0.07), or Bishop Score in the sixth hour (P = 0.185). But oxytocin levels in the three groups differed significantly (P = 0.022) (Table 1).

In three groups of buccal, sublingual, and vaginal methods, respectively, the causes of pregnancy termination and labor induction are 61.3, 50, 73% for postdate, 12, 18, 11% for rupture of membrane, 9.3, 23, 10% for labor pain, 5.3, 1, 3% for gestational diabetes, and 12, 7, 3% for gestational hypertension. For the three groups of buccal, sublingual, and vaginal delivery, the vaginal delivery rates within 24 hours of the start of induction were, respectively,89,87, and 83, which is statistically different (P < 0.005).The first group of patients (49, 41, and 56%) had meconium as the reason for the cesarean section; the second group (36, 43, and 44%) had non-reassuring FHR pattern; and the third group (no reaction to labor induction) had no response.

Additionally, 11% of the sublingual group has an arrest in dilatation. There were variations between the buccal, sublingual, and vaginal groups (P = 0.220) in terms of oxytocin requirements, which were 39, 22, and 21%, respectively. While not all groups experienced maternal problems such fever, chills, nausea, or vomiting, uterine tachysystole was noted in 3% of participants who received sublingual misoprostol. For every group, uterine hyper stimulation was almost the same.

No group showed signs of neonatal problems, such as Apgar less than 7 in the first minute, Apgar less than 7 in the fifth minute, or NICU admission. Non-reassuring FHR patterns were 20, 16, and 18%, respectively, and P = 0.79 indicated no significant difference.

Excretion of meconium was 23, 16, and 23%, respectively; these differences are also not statistically significant (P = 0.45).The frequencies of non-reassuring FHR patterns were 20, 22, and 9% for tachycardia, 13, 33, and 9% for extended deceleration, 67, 40, and 82% for varied deceleration, and 5% for late deceleration in the sublingual group for the buccal, sublingual, and vaginal groups, respectively.

**Table 1: Demographic variables among groups**

| Variable | Group | Mean±SD | P-value |
|---|---|---|---|
| **Age/Year** | Buccal | 25.25±5.22 | 0.941 |
| | Sublingual | 25.02±5.49 | |
| | Vaginal | 25.3±6.45 | |
| **BMI (Kg/M$^2$)** | Buccal | 28.16±3.17 | 0.464 |
| | Sublingual | 28.40±4.33 | |
| | Vaginal | 29.02±4.85 | |
| **Total Dose (µg)** | Buccal | 1.14 ±0.425 | 0.804 |
| | Sublingual | 1.18±0.386 | |
| | Vaginal | 1.14±0.355 | |
| **Bishop1** | Buccal | 0.54± 0.72 | 0.070 |
| | Sublingual | 0.65±0.80 | |
| | Vaginal | 0.87 ±0.96 | |
| **Bishop 6** | Buccal | 4.7 ±1.86 | 0.185 |
| | Sublingual | 5.54 ±3.34 | |
| | Vaginal | 5.2 ±2.46 | |
| **Oxytocin** | Buccal | 1.61 ±0.490 | 0.022* |
| | Sublingual | 1.78 ±0.416 | |
| | Vaginal | 1.79±0.410 | |

## Discussion

Misoprostol was created and commercialized in the United States in the 1980s, and since then, it has become more and more well-liked as an IOL agent [14,15]. It is safe and effective for inducing labor [13]. Based on data from meta-analyses, RCTs, and Canadian guidelines, it is likely safe to use misoprostol for cervical ripening and induction of labor [16].

The rates of cesarean sections may not be significantly affected by oral misoprostol [17]. When a suitable cervical maturity is reached with a signifi-

cant degree of patient comfort, oral and buccal medicines are advised for the induction of labor [18]. The sublingual misoprostol group's tachysystole was higher than that of the buccal group, indicating that the findings of Carlan, Blust, and O'Brien [11] are not supported. Carlan et al. examined the impact of both buccal and vaginal misoprostol on 157 pregnant women's ability to induce labor. According to their results, 63% of the vaginal group and 67% of the buccal group delivered their babies vaginally in a 24-hour period. The buccal group had a tachysystole of 38%, which was higher than the vaginal group's 19%.

However, Bartusevicius and Barcaite's [19] results indicate that although there was a larger tachysystole in the Sublingual group, it was not statistically significant. Previous studies [19,20] revealed that misoprostol-treated individuals experienced gastrointestinal symptoms, tachysystole, and hyperstimulation as a result of the medication's dose. Maternal complications included fever, chills, nausea, and vomiting; other complications did not differ significantly between the groups. Neonatal complications included Apgar scores less than seven in the first minutes; Apgar scores less than seven in five minutes, and admission to the NICU department.

The outcomes corroborate those of Bartusevicius [19], who found no discernible differences in neonatal problems, birth mode, or uterine hyperstimulation. The findings of Niroomanesh, Talebzadeh Nori, and Hossain Pour [2] indicate a noteworthy distinction between the problems experienced by mothers and newborns in two groups (oral and sublingual). Compared to the sublingual group, the oral group experienced more nausea, and the sublingual group excreted more meconium [2]. In less than 24 hours, 89% of the buccal group, 87% of the sublingual group, and 83% of the vaginal group reached delivery.

These results are in line with the findings of the study by Bartusevicius and Barcaite [19], which show that 83% of the sublingual group and 76% of the vaginal group reached delivery in less than 24 hours, with the sublingual group experiencing a significantly shorter delivery time [19]. According to their research, there is no discernible difference between the misoprostol buccal and sublingual groups' rates of labor induction throughout term pregnancy in terms of pregnancy outcomes, pregnancy problems, or fetal difficulties.

## Conclusion

This study compared the efficaciousness of sublingual, vaginal, and buccal misoprostol for inducing labor in a full-term pregnancy.

This study discovered that while there was no difference in the three groups' rates of fetal and maternal problems, there was a significant difference in the use of oxytocin and vaginal deliveries within 24 hours of the commencement of induction. Nevertheless, more research using larger samples is required to determine how well these medications act as labor inducing agents.

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