*International Journal of Health Sciences and Research*
*[Indexed, Peer-Reviewed Journal]*
*Volume 16; Issue: 1; January 2026*
*Website: www.ijhsr.org*
*Original Research Article* *ISSN: 2249-9571*

# Comparative Evaluation of Safety and Efficacy of Vaginal Misoprostol Versus Intramuscular Carboprost for Induction of Labour in Intrauterine Foetal Death

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**DOI: https://doi.org/10.52403/ijhsr.20260116**

## ABSTRACT

**Background:** There are scarce data on the safety and efficacy of vaginal Misoprostol and intramuscular Carboprost for induction of labour in intrauterine foetal death (IUFD) cases in our study setting and geographic area.
**Aim and Objectives:** To study safety and efficacy of vaginal Misoprostol in comparison with intramuscular Carboprost for induction of labour in pregnant women with IUFD.
**Materials and Methods:** This is a randomised control study conducted with total of 80 pregnant women beyond 20weeks with IUFD. Patients were divided into two groups *viz.* Group-A received intravaginal Misoprostol (200µg), and Group-B received intramuscular Carboprost (250µg). The outcome measures were induction to delivery interval and need for repeated induction. The maternal safety was evaluated in terms of incidences of side-effects. Statistical analysis was done using IBM Statistical Software for Social Sciences (SPSS) version 20 with $p \leq 0.05$ considered statistically significant.
**Results:** The majority of study subjects belonged to age group of 19-25 years in both Misoprostol group (50%) and Carboprost group (57.5%). Majority of the study subjects i.e., 47.5% and 40% had term IUFD in Misoprostol group and Carboprost group respectively. Only one dose of Misoprostol and Carboprost was used in majority of the study subjects i.e., 62.5% and 97.5% respectively. The mean induction to delivery interval was significantly lesser with Carboprost when compared with Misoprostol (344.6 vs 761.7 mins; $p<0.001$). In Misoprostol group, top three ranked major adverse effects observed were shivering (35%), vomiting (20%), and nausea (5%). Similarly, in Carboprost group, the top three ranked adverse effects were Diarrhoea & vomiting (20% each), shivering & nausea (12.5% each), hot flush (7.5%). The distribution of adverse effects between groups was statistically significant ($p=0.002$).
**Conclusion:** In conclusion, single dose of intramuscular Carboprost at 250µg could be considered ahead of Misoprostol single dose at 200µg for labour induction in pregnant women with IUFD.

***Keywords:*** Intrauterine foetal death, Misoprostol, Carboprost, Labour induction, Shivering

## INTRODUCTION

Pregnancy loss at any gestational age is a profoundly distressing experience, with the emotional impact often being greater in advanced pregnancies beyond 24 weeks, when the fetus is considered legally viable [1]. Intrauterine fetal death (IUFD), also referred to as stillbirth, is an obstetric event characterized by fetal demise occurring after 20 weeks of gestation [2]. The United States Center for Health Statistics describes fetal death as the birth of a fetus without any signs of life, including absence of respiration, cardiac activity, umbilical cord pulsation, or voluntary muscle movement, regardless of gestational duration [3].

Globally, approximately 2.6 million cases of IUFD occur each year, accounting for nearly one in every 45 births, with the burden disproportionately affecting developing regions such as South Asia and Africa [4]. In the Indian context, data from the National Family Health Survey (NFHS-5) indicate that the perinatal mortality rate during the five years preceding the 2019–2021 survey was 31.9. Although the overall rate has remained relatively stable over time, substantial inter-state variation exists, with Kerala reporting the lowest IUFD rate at 6.2, while Uttar Pradesh and Madhya Pradesh report higher rates of 43.9 and 34.1, respectively [2].

IUFD may result from multiple etiological factors, including pre-eclampsia, intrapartum complications, placental or umbilical cord abnormalities, congenital anomalies, maternal infections such as malaria and syphilis, and poor maternal health status. Identified risk factors include advanced maternal age (over 35 years), smoking, substance abuse, use of assisted reproductive technologies, and primigravidity [5]. Clinically, IUFD is suspected when fetal movements are absent and is confirmed through ultrasonography. In many cases, spontaneous onset of labour occurs within two weeks; therefore, women may opt for expectant management and vaginal delivery of the fetus [6].

Labour induction is defined as the deliberate initiation of uterine contractions prior to the spontaneous onset of labour to achieve delivery of the fetoplacental unit, using either mechanical or pharmacological interventions [7]. The likelihood of successful induction is closely related to the cervical condition at the time of intervention, with women having a low Bishop's score (≤3) demonstrating significantly higher rates of induction failure [8].

Commonly employed methods for labour induction include amniotomy, mechanical cervical dilatation using balloon catheters, and pharmacological agents such as prostaglandin E1 (Misoprostol), prostaglandin E2 (Dinoprostone), and Oxytocin [9]. Misoprostol has long been preferred for pre-induction cervical ripening and is among the pharmacological agents approved by the United States Food and Drug Administration for this purpose [4]. It is a prostaglandin E1 analogue, structurally a methyl ester additionally methylated at the C-16 position, and acts as a potent uterine smooth muscle stimulant by selectively binding to EP-2 and EP-3 prostanoid receptors [10].

Carboprost, a synthetic analogue of prostaglandin F2α, plays a crucial role in the management of refractory uterine atony. When initial measures such as uterine massage and oxytocin administration are ineffective, and methylergonovine is either contraindicated or unsuccessful, prompt restoration of uterine tone is essential to avert life-threatening postpartum hemorrhage. Carboprost induces effective uterine smooth muscle contraction in approximately 90% of cases following the first or second dose. Although its pharmacological action may result in adverse effects such as nausea, vomiting, or diarrhea, these are generally considered minor when weighed against the potential

risks of severe hemorrhage, massive blood transfusion, or surgical intervention [11].

A review of the available literature indicates limited evidence regarding the safety and efficacy of vaginal misoprostol and intramuscular carboprost for labour induction in IUFD cases within the present study setting and geographical region. Therefore, the present study was undertaken to evaluate labour induction outcomes, associated adverse effects, and the requirement for repeat induction following the administration of vaginal misoprostol and intramuscular carboprost in pregnant women diagnosed with IUFD.

## MATERIALS & METHODS

### Study design and patients

This is a randomised control study conducted with total of 80 pregnant women beyond 20weeks with IUFD admitted in the antenatal ward at Sri Chamarajendra Hospital, Hassan Institute of Medical Sciences (HIMS), Hassan, Karnataka. Patients were randomized two groups *viz.* Group A (n=40) received intravaginal Misoprostol (200µg), and Group B (n=40) received intramuscular Carboprost (250µg).

### Inclusion criteria

1. Pregnant women in gestation age >20 weeks
2. Pregnant women diagnosed with IUFD but not in labour

### Exclusion criteria

Pregnant women with

1. IUFD less than 20weeks of gestation
2. IUFD in labour
3. IUFD with eclampsia
4. IUFD with malpresentation
5. IUFD with glaucoma, asthma, epilepsy
6. IUFD with coagulopathy
7. Vaginal delivery is contraindicated
8. Pregnancy with low lying placenta or grade 3 and grade 4 placenta previa
9. Severe cardiac, liver, lung and renal impairment

### Data collection

A detailed demographic characteristic, and patient history were recorded in the structured proforma. Thorough general and systemic examinations per abdomen, per speculum, per vaginal examinations, routine blood investigations and USG obstetric scan were be carried out. Patients were counselled about the method and side effects of the drugs.

The study drugs *viz.* Misoprostol, 200µg (Group-A), and Carboprost, 250µg (Group-B) were administrated. All the study subjects were informed about the signs and symptoms after induction. After initiation of labour, signs of labour and Bishop's score were assessed at 4, 8, 12 and 24hrs. Later the mode of delivery, need for repeated methods of induction, and induction to delivery interval were recorded and analyzed.

Subsequent to Misoprostol or Carboprost administration uterine contractions, pulse, blood pressure, temperature and systemic symptoms were monitored 2 hourly and the labour progress was monitored using WHO modified Partograph. In active labour, Oxytocin augmentation if required was started after 4 hours of the last dose of Misoprostol, using an established standard Oxytocin regime of 5 units in one litre ringer lactate at 6-8 drops per minute with increments at half hourly intervals. Successful treatment was defined as delivery within 72 hours of first Misoprostol dose. If the first course of induction was unsuccessful, after a break of 24 hours, second course of induction was started with the vaginal Misoprostol of same dose. If not expelled with repeat course, induction was categorized as failed. Labour complications, if any, were managed according to standardized in-house protocols.

### Statistical Analysis

Data were entered in Microsoft Excel 2021 and statistical analysis was done using IBM Statistical Software for Social Sciences (SPSS) version 20. Categorical variables were represented in the form of percentages,

and frequencies. Continuous variables were presented as descriptive statistics (Mean and Standard deviation). Categorical variables were analysed using the Chi-square test. Comparison of continuous variables between the study groups was done using independent sample t-test. $p \leq 0.05$ was considered statistically significant.

## RESULT

The majority of study subjects belonged to age group of 19-25 years in both Group-A (50%) and Group-B (57.5%). 57.5% and 67.5% of subjects in Group-A and Group-B respectively were from lower-middle clas. Major proportion of patients were non-consanguineous in both Group-A (70%) and Group-B (80%). Primi obstetric score was observed in majority of study subjects i.e., 62.5% and 57.5% in Group-A and Group-B respectively (Table 1).

**Table 1. Demographic and patient characteristics**

| Variables | Group-A (Misoprostol, 200µg) | Group-B (Carboprost, 250µg) | p-value |
|---|---|---|---|
| **Age** | | | |
| 19 – 25 Years | 20 (50.0) | 23 (57.5) | 0.168 |
| 26 – 30 Years | 17 (42.5) | 10 (25.0) | |
| >31 Years | 3 (7.5) | 7 (17.5) | |
| **Socio-economic status (SES)** | | | |
| Lower class | 2 (5.0) | 4 (10.0) | 0.451 |
| Lower middle class | 23 (57.5) | 27 (67.5) | |
| Middle class | 4 (10.0) | 3 (7.5) | |
| Upper middle class | 11 (27.5) | 6 (15.0) | |
| **Consanguinity** | | | |
| 1st degree consanguineous | 11 (27.5) | 8 (20.0) | 0.345 |
| 2nd degree consanguineous | 1 (2.5) | 0 (0.0) | |
| Non-consanguineous | 28 (70.0) | 32 (80.0) | |
| **Obstetric score** | | | |
| Primi | 25 (62.5) | 23 (57.5) | 0.648 |
| Multi | 15 (37.5) | 17 (42.5) | |

Values were n (%) unless otherwise stated

The results on distribution of study subjects based on gestation period in both Group-A and Group-B were plotted in Figure 1. Results revealed that in Group-A, majority of the study subjects i.e., 47.5% had term IUFD followed by late term IUFD (22.5%), pre-term IUFD (15%), moderate term IUFD (10%), and extreme pre-term IUFD (5%). Similarly in Group-B, majority of the study subjects i.e., 40% had term IUFD followed by pre-term IUFD (22.5%), moderate- & late-term IUFD (17.5% each), 2.5% of study subjects had extreme pre-term IUFD. However, distribution of study subjects based on gestation age IUFD was not statistically significant between Group-A and Group-B (p=0.688).

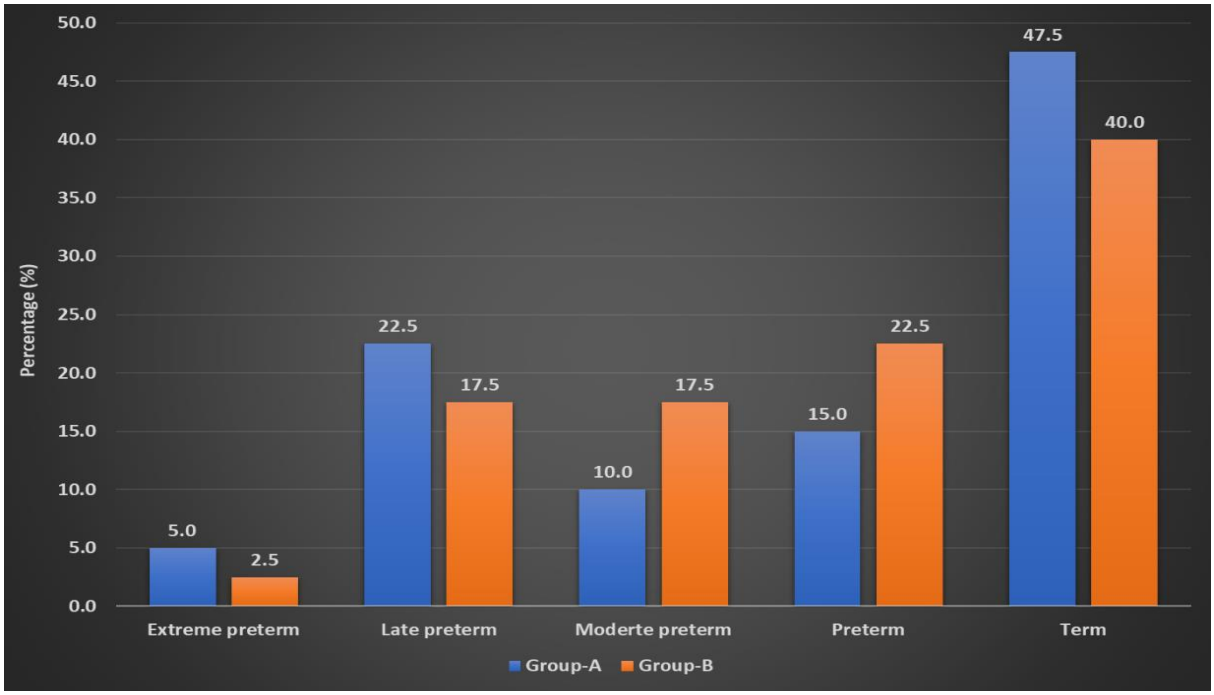


**Figure 1. Distribution of study subjects based on gestational age IUFD**

The results on distribution of study subjects based on number of doses of study drugs used in both Group-A and Group-B were plotted in Figure 2. Results depicted that in both Group-A and Group, only one dose of Misoprostol and Carboprost was used in majority of the study subjects i.e., 62.5% and 97.5% respectively. While two doses of Misoprostol and Carboprost were used in 37.5% and 2.5% of study subjects in Group-A and Group-B respectively. The distribution of study subjects based on no. of study drugs used was statistically significant between Group-A and Group-B ($p<0.001$).

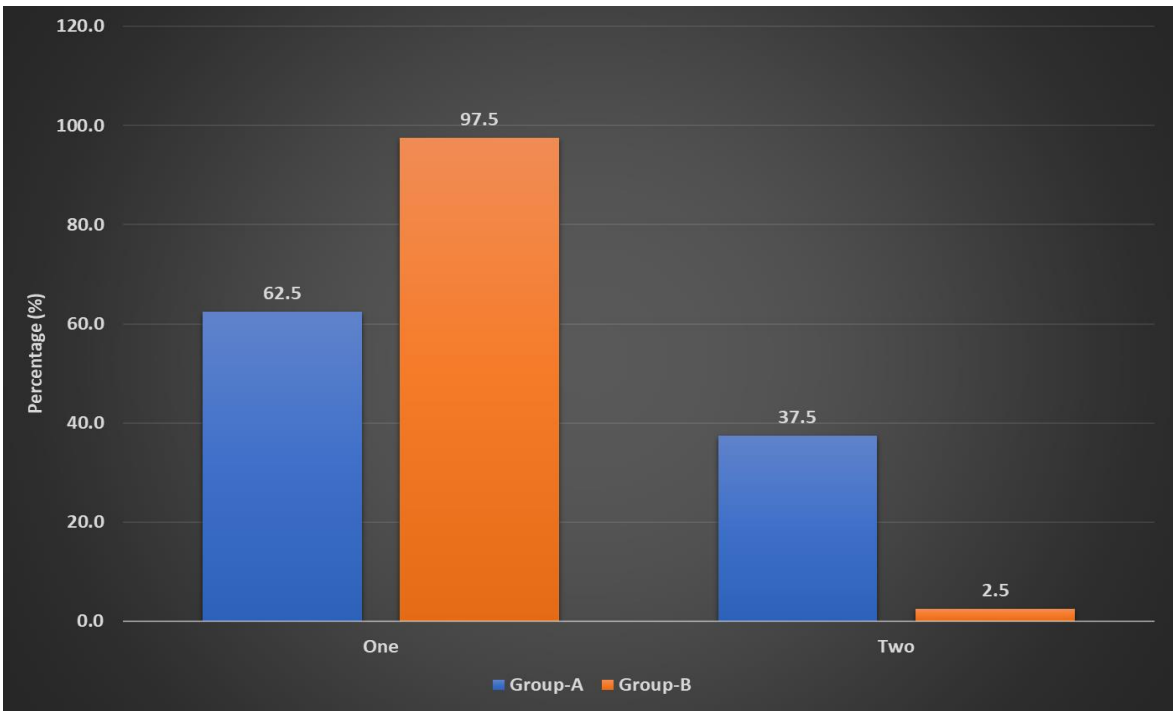


**Figure 2. Distribution of study subjects based on number of doses of study drugs used**

The mean induction to delivery interval was significantly lesser in Group-B when compared with Group-A (498.6 vs 804.7 mins; p<0.001). Furthermore, the post-induction Bishop score was significantly lesser in Group-A when compared with Group-B (5.7 vs 7.3; p=0.006) (Table 2).

**Table 2. Outcomes**

| Variables | Group A | Group B | p-value |
|---|---|---|---|
| Induction to delivery interval, mins | 804.7 ± 642.0 | 498.6 ± 457.5 | 0.001 |
| Post-induction Bishop score | 5.7 ± 2.4 | 7.3 ± 2.6 | 0.006 |

Values were mean ± SD

The results on adverse effects observed post administration of study drugs in both Group-A and Group-B were represented in Table 3. Results implied that, in Group-A, the top three ranked adverse effects observed were shivering (35%), vomiting (20%), and nausea (5%). Similarly in Group-B, the top three ranked adverse effects were diarrhoea & vomiting (20% each), shivering & nausea (12.5% each), hot flush (7.5%). The distribution of adverse effects between groups was statistically significant (p=0.002).

**Table 3. Adverse effects**

| Variables | Group A | Group B | p-value |
|---|---|---|---|
| Abdominal pain | 1 (2.5) | 0 (0.0) | 0.002 |
| Chills | 14 (35.0) | 5 (12.5) | |
| Chills + Vomiting | 0 (0.0) | 1 (2.5) | |
| Chills + Vomiting + BL53 | 0 (0.0) | 1 (2.5) | |
| Diarrhoea | 1 (2.5) | 8 (20.0) | |
| Fever | 0 (0.0) | 1 (2.5) | |
| Headaches | 0 (0.0) | 1 (2.5) | |
| Hot flushes | 0 (0.0) | 3 (7.5) | |
| Loose stools | 0 (0.0) | 2 (5.0) | |
| Nausea | 2 (5.0) | 5 (12.5) | |
| Vomiting | 8 (20.0) | 8 (20.0) | |

Values were n (%) unless otherwise stated

The incidences of repeated methods of induction were comparatively lesser in Group-B than Group-A (7.5% vs. 15.0%). However, distribution of incidences of repeated methods of induction between Group-A and Group-B was statistically non-significant (p=0.284) (Table 4).

**Table 4. Repeated methods of induction**

| Variables | | Group A | Group B | p-value |
|---|---|---|---|---|
| Repeated methods of induction | Yes | 6 (15.0) | 3 (7.5) | 0.284 |
| | No | 34 (85.0) | 37 (92.5) | |

Values were n (%) unless otherwise stated

## DISCUSSION

Following IUFD, the available management options include expectant management awaiting spontaneous onset of labour or active induction of labour [6]. When expectant management is adopted, there is a potential risk of developing disseminated intravascular coagulation, which carries significant dangers such as haemorrhage, need for blood transfusion, and maternal mortality. Consequently, labour induction represents the alternative approach and is widely accepted as an evidence-based obstetric practice. In cases of IUFD with a favourable or ripened cervix, the decision to proceed with induction is generally uncomplicated, and the process is often straightforward [4]. Accordingly, the present randomized controlled study was undertaken to evaluate labour induction outcomes, adverse effects, and the requirement for repeat induction following the use of vaginal Misoprostol and intramuscular Carboprost in women with IUFD.

In the present study, the majority of participants belonged to the 19–25-year age group in both the Misoprostol (50%) and Carboprost (57.5%) groups. These observations are consistent with findings reported in earlier studies. Sharmin et al., in a randomized clinical trial comparing oral and vaginal Misoprostol for termination of pregnancy in IUFD cases, reported mean ages of 26.7 years and 28.1 years in the oral and vaginal Misoprostol groups, respectively [4]. Similar age distributions were also noted by Nyende et al., who reported mean ages of 26.3 years in the oral Misoprostol group and 24.7 years in the vaginal Misoprostol group [12].

In the current study, the mean induction-to-delivery interval was 8.3 hours in the Carboprost group and 13.4 hours in the Misoprostol group, with the difference being statistically significant ($p < 0.001$). These results are comparable with those of Wagaarachchi et al., who reported a mean induction-to-delivery interval of 8.5 hours using a combination of mifepristone and Misoprostol [13]. Similarly, Sharma et al., demonstrated that the combination of mifepristone and Misoprostol was more effective than Misoprostol alone for induction of labour in late IUFD cases, with mean induction-to-delivery intervals of 6.8 hours and 11.82 hours, respectively [14]. Hill et al., also reported a mean induction-to-delivery interval of 14.3 hours using various prostaglandin analogues and induction methods [15]. Fairley et al., observed an induction-to-delivery interval of approximately 7 hours with the use of 400 µg vaginal or oral Misoprostol in combination with Mifepristone [16].

Hofmeyr et al., in a randomized placebo-controlled trial evaluating oral Misoprostol (400 µg) during the third stage of labour, observed that shivering occurred more frequently in the Misoprostol group compared with placebo (19% vs 5%), concluding that shivering is a specific side effect of orally administered Misoprostol in the puerperium [17]. Lumbiganon et al., further reported a dose-dependent association between Misoprostol and adverse effects such as shivering and pyrexia during the third stage of labour. When comparing doses of 400µg and 600µg, higher rates of shivering (28%) and pyrexia (7.5%) were observed with the 600µg dose, compared with 19% and 2%, respectively, in the 400µg group [18]. In agreement with these findings, the most common adverse effects noted in the present study among patients receiving Misoprostol were shivering (35%), vomiting (20%), and nausea (5%). Importantly, serious complications such as uterine rupture were not observed. Additionally, none of the study participants experienced severe postpartum haemorrhage or coagulation abnormalities.

The major limitation of our randomized control study was the small sample size. Hence, future randomized control studies with larger sample size are warranted.

## CONCLUSION

In conclusion, our study findings demonstrated that intramuscular Carboprost at single dose of 250µg for induction of labour in pregnant women with IUFD has shorter induction to delivery interval along with lesser incidences of shivering adverse effects when compared to vaginal Misoprostol at 200µg single dose. Hence, single dose of intramuscular Carboprost at 200µg could be considered ahead of Misoprostol single dose at 200µg for labour induction in pregnant women with IUFD.

### *Declaration by Authors*

**Ethical Approval:** The study was initiated after due permission from Institutional Ethical Committee and Review Board of Hassan Institute of Medical Sciences (HIMS), Hassan, Karnataka. A written informed consent was obtained from all the patients participated in the study.

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declared no conflict of interest

## REFERENCES

1. Nzewi C, Araklitis G, Narvekar N. The use of mifepristone and misoprostol in the management of late intrauterine fetal death. Obstet Gynaecol. 2014; 16:233–238.
2. Patidar S, Mahadik K. Profile of intrauterine fetal demise in Central India: is it preventable?. Int J Reprod Contracept Obstet Gynecol. 2025; 14:550-4.
3. Martin JA, Hoyert DL. The national fetal death file. Seminars in Perinatology. 2002;26(1):3-11.
4. Sharmin S, Naznin F, Akter N, Begum B, Jesmin S, Khatun I. Comparison between vaginal and oral misoprostol for the induction of labour in patients with intrauterine fetal death. Ibrahim Card Med J. 2021;11(2):56–61.
5. Leisher SH, Teoh Z, Reinebrant H, Allanson E, Blencowe H, Erwich JJ, Frøen JF, Gardosi J, Gordijn S, Gülmezoglu AM, Heazell AE, Korteweg F, Lawn J, McClure EM, Pattinson R, Smith GC, Tunçalp Ö, Wojcieszek AM, Flenady V. Classification systems for causes of stillbirth and neonatal death, 2009-2014: an assessment of alignment with characteristics for an effective global system. BMC Pregnancy Childbirth. 2016; 16:269.
6. Silver RM. Fetal death. Obstet Gynecol. 2007;109(1):153-67.
7. Mackenzie IZ. Induction of labour at the start of the new millennium. Reproduction. 2006;131(6):989-98.
8. Deshmukh VL, Yelikar KA, Waso V. Comparative study of efficacy and safety of oral versus vaginal misoprostol for induction of labour. J Obstet Gynaecol India. 2013;63(5):321–324.
9. Mozurkewich EL, Chilimigras JL, Berman DR, Perni UC, Romero VC, King VJ, Keeton KL. Methods of induction of labour: a systematic review. BMC Pregnancy Childbirth. 2011; 11:84.
10. Senior J, Marshall K, Sangha R, Clayton JK. In vitro characterization of prostanoid receptors on human myometrium at term pregnancy. Br J Pharmacol. 1993;108(2):501-6.
11. Vallera C, Choi LO, Cha CM, Hong RW. Uterotonic Medications: Oxytocin, Methylergonovine, Carboprost, Misoprostol. Anesthesiol Clin. 2017; 35(2): 207-219.
12. Nyende L, Towobola OA, Mabina MH. Comparison of vaginal and oral misoprostol for the induction of labour in women with intra-uterine foetal death. East Afr Med J. 2004;81(4):179–182.
13. Wagaarachchi PT, Ashok PW, Narvekar NN, Smith NC, Templeton A. Medical management of late intrauterine death using a combination of mifepristone and misoprostol. BJOG. 2002;109(4):443–447.
14. Sharma P, Sharma S, Shergill HK. Comparative evaluation of low-dose vaginal misoprostol and intracervical dinoprostone for cervical ripening and

induction of labour in term pregnancy. Int J Reprod Contracept Obstet Gynecol. 2016;5(12):4303–4308.
15. Hill JB, Thigpen BD, Bofill JA, Magann E, Moore LE, Martin JN. A randomized clinical trial comparing vaginal misoprostol versus cervical Foley plus oral misoprostol for cervical ripening and labor induction. Am J Perinatol. 2009;26(1):33–38.
16. Fairley TE, Mackenzie M, Owen P, Mackenzie F. Management of late intrauterine death using a combination of mifepristone and misoprostol-experience of two regimens. Eur J Obstet Gynecol Reprod Biol. 2005;118(1):28–31.
17. Hofmeyr GJ, Nikodem VC, de Jager M, Gelbart BR. A randomised placebo controlled trial of oral misoprostol in the third stage of labour. Br J Obstet Gynaecol. 1998;105(9):971-5.
18. Lumbiganon P, Hofmeyr J, Gülmezoglu AM, Pinol A, Villar J. Misoprostol dose-related shivering and pyrexia in the third stage of labour. WHO Collaborative Trial of Misoprostol in the Management of the Third Stage of Labour. Br J Obstet Gynaecol. 1999; 106(4):304-8.

How to cite this article: Priyanka G, Suma HR, Girija BS. Comparative Evaluation of Safety and Efficacy of Vaginal Misoprostol Versus Intramuscular Carboprost for Induction of Labour in Intrauterine Foetal Death. *Int J Health Sci Res.* 2026; 16(1):132-140. DOI: *https://doi.org/10.52403/ijhsr.20260116*

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