

## A STUDY ON THE EVALUATION OF CARDIOTOCOGRAPHIC AND CORD BLOOD CHANGES IN INDUCED LABOR WITH DINOPROSTONE

Subha Muthulakshmi R.<sup>1</sup>, Divya C.<sup>2</sup>

Received : 01/01/2026  
Received in revised form : 06/02/2026  
Accepted : 25/02/2026

**Keywords:**

Cardiotocography, Dinoprostone,  
Infant, Labor, Umbilical Arterial Blood  
Gas Analysis.

**Corresponding Author:**

Dr. Divya C.,  
Email: divyaharikaran74312@gmail.com

DOI: 10.47009/jamp.2026.8.2.81

Source of Support: Nil,  
Conflict of Interest: None declared

Int J Acad Med Pharm  
2026; 8 (2); 443-447



<sup>1</sup>Assistant Professor, Department of Obstetrics and Gynaecology, Madurai Medical College, Tamilnadu, India.

<sup>2</sup>Assistant Professor, Department of Obstetrics and Gynaecology, Madurai Medical College, Tamilnadu, India.

### ABSTRACT

**Background:** Labour induction with prostaglandins is widely practiced for cervical ripening, but its effect on cardiotocographic (CTG) patterns and their correlation with neonatal acid–base status remains unclear. This study evaluated CTG abnormalities associated with dinoprostone induction and their relationship with perinatal outcomes using umbilical cord blood gas analysis. **Materials and Methods:** In this open-label prospective comparative study, 100 term pregnant women with Bishop score <5 were randomly allocated into two groups: dinoprostone (Group A, n=50) and control (Group B, n=50). Continuous CTG monitoring was performed. Mode of delivery, APGAR scores, NICU admission, and cord blood gas parameters were compared using appropriate statistical tests. **Results:** Baseline characteristics were comparable (mean age 23.88 ± 3.55 vs. 24.02 ± 3.80 years; p=0.85). Oxytocin augmentation was significantly higher in the dinoprostone group (32% vs. 2%, p<0.001). Tachysystole (4% vs. 0%), hypertonus (2% vs. 0%), and hyperstimulation (14% vs. 2%) were more frequent with dinoprostone. FHR accelerations >2 were observed in 72% vs. 76% (p=0.736), and decelerations in 28% vs. 20% (p=0.482). Mean FHR (134.5 ± 15.1 vs. 139.2 ± 9.1 bpm; p=0.066) and variability (6.1 ± 1.63 vs. 6.66 ± 1.55; p=0.081) were similar. Vaginal delivery rates were 76% and 74% (p=0.965). Five-minute APGAR scores were higher in the control group (8.46 ± 0.73 vs. 7.98 ± 1.36; p=0.031). NICU admissions (20% vs. 12%; p=0.413) and cord blood pH (7.20 ± 0.09 vs. 7.22 ± 0.07; p=0.145) were comparable. **Conclusion:** Dinoprostone provides effective labour induction with comparable neonatal acid–base status and delivery outcomes, though it is associated with higher oxytocin requirement and increased, but clinically non-significant, CTG abnormalities.

## INTRODUCTION

Labour induction is one of the common obstetric interventions that involves ripening of the cervix and uterine contractions, with 25% of women undergoing these procedures worldwide.<sup>[1,2]</sup> Cervical ripening and preparedness are important before labour induction and are assessed using the bishop score, which evaluates the cervical favourability. The approaches that are available include both the pharmacological and non-pharmacological methods, though there are variations in national and international guidelines due to heterogeneity between the studies and inconsistencies in the outcome definitions.<sup>[2]</sup>

Prostaglandins, including PGE1 (e.g. misoprostol) and PGE2 (e.g. dinoprostone), are safe and effective

options for labour induction. Misoprostol is used at 25 µg doses administered orally, vaginally, or sublingually, and dinoprostone is used intracervically or vaginally in the posterior fornix.<sup>[1,2]</sup> Dinoprostone is a highly effective cervical ripening agent with a better safety profile than misoprostol. Even though it is more expensive, it allows dose control by removable formulations. The intravaginal dinoprostone has similar safety and efficacy to misoprostol in terms of rates of caesarean delivery, uterine tachysystole, hyperstimulation, and NICU admission, and the drug required more oxytocin augmentation than misoprostol.<sup>[3]</sup>

A review by Deepanshi et al. reported that dinoprostone showed a more controlled process of induction with a better safety profile than misoprostol and also concluded that dinoprostone is a preferable

and suitable drug for situations requiring controlled induction.<sup>[4]</sup> Continuous intrapartum electronic foetal monitoring is recommended during the induced labour to detect foetal hypoxia, though its accuracy in predicting is limited, and the intervention requires knowledge of the physiology rather than the recognition of patterns alone.<sup>[5]</sup> Griffiths et al. studied the physiological approach to cardiotocography (CTG) interpretation and reported that labour contractions threaten foetal oxygenation and concluded that human foetuses have compensatory mechanisms, and these mechanisms may be impaired with poor foetal reserves, increased metabolic demands and non-hypoxic pathways like chorioamnionitis.<sup>[6]</sup>

Labour induction with uterotonic agents increases foetal hypoxic stress through uterine activity, which can be measured using cord blood parameters. Labour involves hypoxic stress due to contractions and cord compression, which interrupt circulation. Uterotonic agents increase the risk of hypoxic-ischaemic injury in foetuses with impaired compensation. This approach should apply foetal physiology to distinguish between compensation and decompensation. Non-hypoxic factors, such as chorioamnionitis, may worsen neurological injury.<sup>7</sup> Labour induction reduces risks when pregnancy continuation is unsafe. Prostaglandins initiate labour and affect foetal oxygenation. Continuous CTG monitors foetal compromise, although its interpretation remains subjective. Umbilical cord blood analysis provides an objective assessment. Limited data are available on drug-induced changes in monitoring parameters. A systematic evaluation of monitoring and cord blood parameters is necessary to improve the interpretation of results during induced labour.

#### **Aim**

This study aimed to evaluate the cardiotocographic abnormalities associated with labour induction using dinoprostone gel and assess their correlation with perinatal outcomes based on cord blood analyses.

## **MATERIALS AND METHODS**

This open-label prospective comparative study was conducted in 100 pregnant women at the Government Rajaji Hospital, Madurai, over 6 months. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was obtained from the participants before the study initiation.

#### **Inclusion Criteria**

Women aged 18-35 years with singleton pregnancy, vertex presentation, gestational age  $\geq 37$  weeks, Bishop score  $< 5$ , no spontaneous contractions ( $< 4$ /hour), reactive non-stress test, and no contraindication to vaginal delivery.

#### **Exclusion Criteria**

Women with ruptured membranes, chorioamnionitis, previous caesarean or uterine surgery, foetal distress

with pathological umbilical Doppler, intrauterine growth restriction, maternal comorbidities such as diabetes, hypertension, preeclampsia, cardiac disease, thyroid dysfunction, or those unwilling to consent.

#### **Materials**

The materials used included dinoprostone gel (0.5 mg), pre-heparinised syringes for cord blood sampling, electronic foetal monitoring equipment, standard obstetric devices, oxytocin infusion setup, laboratory equipment for blood gas analysis, and routine investigation facilities, including haematological, biochemical, and imaging investigations.

#### **Methods**

One hundred pregnant women with term gestation and no spontaneous contractions were selected using random sampling and assigned to two groups of 50 participants each. Group A received an initial dose of 0.5 mg intracervical dinoprostone gel, with repeat dosing after 6 h if adequate contractions were not established. Group B were the control group without dinoprostone gel. Patients who developed adequate contractions ( $> 3$  contractions in 10 min) were not redosed. CTG was performed before induction to exclude foetal distress and to assess uterine activity. The bishop score was recorded on admission and after the pre-induction interval.

Women who did not achieve adequate labour were augmented with oxytocin infusion until satisfactory contractions were achieved. Continuous electronic foetal heart rate (FHR) and uterine activity monitoring were performed according to standardised protocols. CTG tracings were reviewed, and abnormalities were classified using established criteria. After delivery, the umbilical cord was double-clamped, and arterial blood was collected in a pre-heparinised syringe for pH and blood gas analysis. Routine investigations, including haemoglobin, urine albumin and sugar, platelet count, random blood sugar, blood urea, serum creatinine, LDH, bilirubin, liver enzymes, ultrasound with Doppler, thyroid-stimulating hormone, and echocardiography, were performed as indicated.

#### **Statistical analysis**

Data were expressed as Mean, Standard deviation, frequency, and percentage. Continuous variables were compared using the independent sample t-test, and the chi-square test was used for categorical variables. Significance was defined as  $P < 0.05$ , and analysis was performed using IBM-SPSS version 25.

## **RESULTS**

The age distribution was similar in both groups, with 64% aged  $< 25$  years and 36% aged  $> 25$  years, and the mean age was similar between Groups A ( $23.88 \pm 3.555$  years) and B ( $24.02 \pm 3.809$  years,  $p = 0.85$ ). Primigravidae were higher in Group A (58 vs. 46%), whereas multigravida were higher in Group B (54 vs. 42%). Most patients were  $> 38$  weeks in both groups,

with 72% of patients in Group A and 64% in Group B. The mean gestational age was higher in Group A ( $39.3 \pm 1.015$  weeks) than in Group B ( $38.8 \pm 1.178$  weeks) ( $p = 0.52$ ) (Table 1). Postdated pregnancy was

the most common indication for induction, accounting for 54% of cases, followed by oligohydramnios (46%).

**Table 1: Comparison of baseline demographic and maternal characteristics between groups**

		N (%)		P value
		Group A	Group B	
Age (years)	< 25	32(64%)	32(64%)	-
	> 25	18(36%)	18(36%)	
	Mean $\pm$ SD	23.88 $\pm$ 3.555	24.02 $\pm$ 3.809	
Gravida	Primi	29(58%)	23(46%)	-
	Multi	21(42%)	27(54%)	
Gestational Age	< 38 weeks	14(28%)	18(36%)	-
	> 38 weeks	36(72%)	32(64%)	
	Mean $\pm$ SD	39.3 $\pm$ 1.015	38.8 $\pm$ 1.178	

Syntonic requirement was higher in Group A (32 vs. 2%,  $p < 0.001$ ). For CTG changes, tachysystole occurred in 4% of Group A and 0% in Group B.

Hypertonus was 2% in Group A and 0% in Group B. Hyperstimulation was higher in Group A (14 vs. 2%,  $p = 0.814$ ). [Table 2]

**Table 2: Comparison of Labour Progress and Uterine Activity between groups**

		N (%)		P value
		Group A	Group B	
Syntonic requirement	Yes	16(32%)	1(2%)	<0.001
	No	34(68%)	49(98%)	
CTG Change	Tachysystole	2(4%)	0	0.814
	Hypertonus	1(2%)	0	
	Hyperstimulation	7(14%)	1(2%)	

FHR accelerations  $>2$  occurred in 72% and 76% of patients in Groups A and B, while accelerations  $< 2$  occurred in 28% and 24%. The mean accelerations were similar between groups ( $1.66 \pm 0.895$  vs.  $1.72 \pm 0.882$ ,  $p = 0.736$ ). FHR decelerations occurred in

28% and 20% of the patients in Groups A and B ( $p = 0.482$ ). The mean FHR was lower in Group A ( $134.52 \pm 15.118$  vs.  $139.16 \pm 9.135$  bpm;  $p = 0.066$ ). FHR variability was lower in Group A ( $6.1 \pm 1.632$  vs.  $6.66 \pm 1.547$ ;  $p = 0.081$ ). [Table 3]

**Table 3: Comparison of FHR characteristics between groups**

Parameters		N (%)		P value
		Group A	Group B	
FHR Accelerations	< 2	14(28%)	12(24%)	0.736
	> 2	36(72%)	38(76%)	
	Mean $\pm$ SD	1.66 $\pm$ 0.895	1.72 $\pm$ 0.882	
FHR Decelerations	Yes	14(28%)	10(20%)	0.482
	No	36(72%)	40(80%)	
Mean FHR		134.52 $\pm$ 15.118	139.16 $\pm$ 9.135	0.066
FHR Variability		6.1 $\pm$ 1.632	6.66 $\pm$ 1.547	0.081

Labour naturalis was the most common delivery mode (76% in Group A and 74% in Group B), followed by LSCS (16% and 18%) and instrumental vaginal delivery (8% each,  $p = 0.965$ ). At 1 min, APGAR scores  $>5$  were higher in both groups (84% in Group A and 92% in Group B), with mean scores

of  $6.76 \pm 1.222$  and  $7.0 \pm 0.881$  ( $p = 0.263$ ). At 5 minutes, APGAR scores  $>5$  were higher with 94% in Group A, and 100% in Group B, with means of  $7.98 \pm 1.363$  and  $8.46 \pm 0.734$  ( $p = 0.031$ ). The NICU admission rates were 20% in Group A and 12% in Group B ( $p = 0.413$ ). [Table 4]

**Table 4: Comparison of delivery and neonatal outcomes between groups**

		N (%)		P value
		Group A	Group B	
Mode of Delivery	Labor Naturalis	38(76%)	37(74%)	0.965
	LSCS	8(16%)	9(18%)	
	Instrumental Vaginal Delivery	4(8%)	4(8%)	
APGAR (1 min)	< 5	8(16%)	4(8%)	0.263
	> 5	42(84%)	46(92%)	
	Mean $\pm$ SD	6.76 $\pm$ 1.222	7 $\pm$ 0.881	
APGAR (5 min)	< 5	3(6%)	0	0.031
	> 5	47(94%)	50(100%)	
	Mean $\pm$ SD	7.98 $\pm$ 1.363	8.46 $\pm$ 0.734	
NICU Admission	Yes	10(20%)	6(12%)	0.413

	No	40(80%)	44(88%)	
--	----	---------	---------	--

Among NICU admissions, mild respiratory distress was the most common, affecting 40% of Group A and 66.7% of Group B, followed by meconium aspiration in 30% and 16.7%, respectively. Birth asphyxia occurred only in Group A (20%), whereas hyperbilirubinemia was noted in 10% of Group A and 16.7% of Group B. Cord blood gas analysis showed

similar values between groups, with PO<sub>2</sub> being lower in Group A (48.72 ± 27.58 vs. 52.38 ± 30.59, p = 0.531). PCO<sub>2</sub> was higher in Group A (38.32 ± 9.75 vs. 36.67 ± 9.35, p = 0.39). The pH values were similar between groups (7.20 ± 0.09 and 7.22 ± 0.07, p = 0.145). [Table 5]

**Table 5: Comparison of NICU Indications and Cord Blood Gas Parameters between groups**

		N (%)		P value
		Group A	Group B	
Reasons for NICU Admission	Mild Respiratory Distress	4(40%)	4(66.7%)	-
	Meconium Aspiration	3(30%)	1(16.7%)	
	Birth Asphyxia	2(20%)	0	
	Hyperbilirubinemia	1(10%)	1(16.7%)	
	PO <sub>2</sub>	48.72 ± 27.58	52.38 ± 30.59	0.531
	PCO <sub>2</sub>	38.32 ± 9.75	36.67 ± 9.35	0.39
	pH	7.20 ± 0.09	7.22 ± 0.07	0.145

## DISCUSSION

In our study, the baseline maternal characteristics were comparable between the groups, with similar age, gravidity, and gestational age profiles. Study Hassan et al. studied 286 patients with a mean age of 27 ± 5.57 years, with 53% aged 20-27 years and 47% between 28-35 years. Most patients were between 40 and 41 weeks of gestation (69%), with 31% between 41 and 42 weeks.<sup>[8]</sup> Studies by Keskin et al., Abid et al., An et al., and D'souza et al. have reported comparable baseline characteristics between groups, including age, BMI, gestational age, and parity.<sup>[9-12]</sup> This indicates proper randomisation in dinoprostone induction studies.

In our study, the syntonic augmentation requirements differed between the groups, whereas CTG abnormalities were infrequent and comparable. Pevzner et al. reported that 17.4% of dinoprostone-treated women experienced uterine contractile abnormalities, with 11.2% showing FHR abnormalities.<sup>[13]</sup> Crane et al. found that dinoprostone gel produced 33.0% tachysystole and 16.5% hyperstimulation rates, while Ramsey et al. noted that 21.1% of patients showed abnormal CTG tracings within 24 hours.<sup>[14,15]</sup> Even with varying augmentation needs, uterine contractile abnormalities remain uncommon, maintaining labour safety.

FHR characteristics were comparable between groups, and our acceleration rates contrasted with those of Pevzner et al., who reported higher FHR abnormalities with dinoprostone (11.2%) than with misoprostol (9.9-10.7%).<sup>[13]</sup> Our finding of lower FHR variability with dinoprostone aligns with Langenegger et al.'s observation (RR 0.33; 95% CI 0.14-0.77).<sup>[16]</sup> Poon et al. found that lower middle cerebral artery pulsatility index values predicted non-reassuring FHR patterns in dinoprostone induction.<sup>[17]</sup> These findings suggest that both agents maintain reassuring FHR characteristics, and that non-reassuring patterns are likely influenced by

underlying foetoplacental factors rather than the induction agent alone.

In our study, the mode of delivery distribution was similar between the groups, with vaginal delivery predominant, and neonatal conditions showed comparable 1-minute APGAR scores, while 5-minute scores were higher in the control group. The NICU admission rates were similar. Our APGAR findings contrasted with Hu et al.'s meta-analysis, showing dinoprostone reduced low 1-minute APGAR scores (OR=0.64, 95%CI:0.48-0.84).<sup>18</sup> Bano et al. found higher 1-minute scores with misoprostol than with dinoprostone (7.25±2.08 vs. 6.62±2.07).<sup>[19]</sup> Our delivery distribution aligned with those of Paudyal et al. and Riaz et al.'s findings.<sup>[20,21]</sup> These results suggest that the intervention did not affect delivery outcomes, with population risk profiles influencing the results more than the induction agent.

Respiratory distress was the most frequent NICU indication in both groups, followed by meconium aspiration, with birth asphyxia in one group and hyperbilirubinemia in both groups. Cord blood parameters were comparable between the groups. Kumar et al. found that 76.67% of babies with suspected foetal distress were born healthy, and that cord pH poorly predicted outcomes.<sup>[22]</sup> Cirik et al. showed that dinoprostone induction in prolonged pregnancies was as safe as in normal pregnancies, while our observation of birth asphyxia in Group A contrasts with Keskin et al.'s findings.<sup>[23,9]</sup> These findings support that cord pH alone is a limited predictor of neonatal outcome and that dinoprostone induction remains a safe option in prolonged pregnancies. The occurrence of birth asphyxia in one group, in contrast to some earlier reports, is likely due to multifactorial perinatal influences rather than a direct drug effect.

### Limitations

The sample size was relatively small, and the study was conducted at a single tertiary care centre over a short duration, which may limit the generalisability

of the results to broader obstetric populations. Although participants were allocated into two groups, the open-label design without blinding could have introduced observer bias. The study included only low-risk term pregnancies with strict exclusion criteria; the findings may not be applicable to high-risk pregnancies where foetal reserve is compromised. The control group did not receive an alternative induction agent, which restricts direct comparative evaluation of dinoprostone with other commonly used pharmacological methods such as misoprostol. Possible confounding factors influencing FHR patterns and neonatal outcomes were not analysed in detail.

## CONCLUSION

Dinoprostone effectively induces labour with no significant difference in the induction delivery interval, oxytocin requirement, mode of delivery, and neonatal outcomes in terms of cord blood gas analysis and APGAR score at 1 and 5 minutes. The number of NICU admissions was similar in both groups. However, CTG abnormalities are more frequent with dinoprostone; it should be used cautiously with continuous FHR and tocographic monitoring.

## REFERENCES

- Shahabuddin Y, Murphy DJ. Cervical ripening and labour induction: A critical review of the available methods. *Best Pract Res Clin Obstet Gynaecol* 2022;79:3–17. <https://doi.org/10.1016/j.bpobgyn.2021.11.008>.
- Wanjari S, Wanjari A. Labour Induction Methods: An Overview. *J Pharm Res Int* 2021;119–27. <https://doi.org/10.9734/jpri/2021/v33i37a31987>.
- Lakho N, Hyder M, Ashraf T, Khan S, Kumar A, Jabbar M, et al. Efficacy and safety of misoprostol compared with dinoprostone for labor induction at term: an updated systematic review and meta-analysis of randomized controlled trials. *Front Med (Lausanne)* 2024;11:1459793. <https://doi.org/10.3389/fmed.2024.1459793>.
- Deepanshi D, Agrawal A, Gupta M. Comparative evaluation of sublingual misoprostol and intracervical dinoprostone gel for labor induction: A review of efficacy, safety, and economic considerations. *Santosh University J Health Sci* 2025;11:145–7. [https://doi.org/10.4103/sujhs.sujhs\\_18\\_25](https://doi.org/10.4103/sujhs.sujhs_18_25).
- Paterson-Brown S, Johnston TA. *Fetal Monitoring During Labour*. Dewhurst's Textbook of Obstetrics & Gynaecology, Chichester, UK: John Wiley & Sons, Ltd; 2018, p. 372–86.
- Griffiths K, Gupta N, Chandraran E. Intrapartum fetal surveillance: a physiological approach. *Obstet Gynaecol Reprod Med* 2022;32:179–87. <https://doi.org/10.1016/j.ogrm.2022.05.003>.
- Oikonomou M, Chandraran E. Fetal heart rate monitoring in labor: from pattern recognition to fetal physiology. *Minerva Obstet Gynecol* 2021;73. <https://doi.org/10.23736/s2724-606x.20.04666-3>.
- Hassan S, Zubair A, Gul S, Javad S, Kumari A, Javed H. Maternal outcomes after induction of labor with dinoprostone in post-date pregnancies. *Proceedings SZMC* 2025;39:79–85. <https://doi.org/10.47489/szmc.v39i2.546>.
- Keskin HL, Kabacaoğlu G, Seçen Eİ, Ustüner I, Yeğın G, Avcı AF. Effects of intravaginally inserted controlled-release dinoprostone and oxytocin for labor induction on umbilical cord blood gas parameters. *J Turk Ger Gynecol Assoc* 2012;13:257–60. <https://doi.org/10.5152/jtgga.2012.41>.
- Abid P, Hussain A, Gul H, Ishtiaq Y, Yaqoob N, Yaqoob A. Comparison of sublingual misoprostol and per vaginal dinoprostone for induction of labour. *Indus J Biosci Res* 2025;3:773–8. <https://doi.org/10.70749/ijbr.v3i5.1504>.
- An G, Ya, Ekin M, Ar L. Comparison of dinoprostone versus oxytocin with dinoprostone for the induction of labour: A retrospective case-control study in a tertiary clinic in Türkiye. *Ann Med Res* 2024;31:380. <https://doi.org/10.5455/annalsmedres.2024.02.045>.
- D'souza A, Samuel C, Katumalla F, Gupta G, Goyal S. A randomized comparison between misoprostol and dinoprostone for cervical ripening and labor induction in patients with unfavorable cervixes. *Int J Reprod Contracept Obstet Gynecol* 2015;1522–8. <https://doi.org/10.18203/2320-1770.ijrcog20150678>.
- Pevzner L, Alfirevic Z, Powers BL, Wing DA. Cardiotocographic abnormalities associated with misoprostol and dinoprostone cervical ripening and labor induction. *Eur J Obstet Gynecol Reprod Biol* 2011;156:144–8. <https://doi.org/10.1016/j.ejogrb.2011.01.015>.
- Crane JM, Young DC, Butt KD, Bennett KA, Hutchens D. Excessive uterine activity accompanying induced labor. *Obstet Gynecol* 2001;97:926–31. [https://doi.org/10.1016/s0029-7844\(01\)01332-1](https://doi.org/10.1016/s0029-7844(01)01332-1).
- Ramsey PS, Meyer L, Walkes BA, Harris D, Ogburn PL Jr, Heise RH, et al. Cardiotocographic abnormalities associated with dinoprostone and misoprostol cervical ripening. *Obstet Gynecol* 2005;105:85–90. <https://doi.org/10.1097/01.AOG.0000146638.51536.09>.
- Langenegger EJ, Odendaal HJ, Grové D. Oral misoprostol versus intracervical dinoprostone for induction of labour. *Int J Gynaecol Obstet* 2005;88:242–8. <https://doi.org/10.1016/j.ijgo.2004.12.005>.
- Poon LC, Chaemsaitong P, Sahota DS, Tse AW, Kwan A, Wong S, et al. VP54.02: Prelabor short-term variability in fetal heart rate by computerised cardiotocogram and maternal fetal Doppler indices for the prediction of labour outcomes. *Ultrasound Obstet Gynecol* 2020;56:305–305. <https://doi.org/10.1002/uog.23253>.
- Hu Z, Lai F, Lin Q, Zhang Y. A meta-analysis and systematic review of the effect of dinoprostone in full term pregnancy labor induction. *Afr J Reprod Health* 2025;29:195–206. <https://doi.org/10.29063/ajrh2025/v29i10.20>.
- Bano S, Yousaf S, Sajjal W, Javad S, Altaf B. Induction of labour with sublingual misoprostol compared to vaginal dinoprostone in terms of neonatal outcome in women with prolonged pregnancy. *Biol Clin Sci Res J* 2024;2024:1254. <https://doi.org/10.54112/bcsrj.v2024i1.1254>.
- Paudyal L. Comparison of APGAR score of newborns with mode of delivery and its associated factors. *Int J Soc Sci Manag* 2020;7:176–82. <https://doi.org/10.3126/ijssm.v7i3.29961>.
- Riaz A, Department of Gynaecology and Obstetrics, Patel Hospital Karachi, Pakistan., Bano A, Dojki SS. Delivery outcome among induced versus spontaneous labor in nulliparous women. *J Dow Univ Health Sci* 2020;14:17–21. <https://doi.org/10.36570/jduhs.2020.1.948>.
- Kumar N, Suman A, Sawant K. Relationship between immediate postpartum umbilical cord blood pH and fetal distress. *Int J Contemp Pediatrics* 2016;113–9. <https://doi.org/10.18203/2349-3291.ijcp20160141>.
- Cirik DA, Taşkın EA, Karcaaltınçaba D, Dai Ö. Study of uterine and fetal hemodynamics in response to labor induction with dinoprostone in prolonged pregnancies with normal amniotic fluid and oligohydramnios. *J Matern Fetal Neonatal Med* 2014;27:691–5. <https://doi.org/10.3109/14767058.2013.829815>.