

**Perinatal Outcome of Vaginal Delivery induced by Prostaglandin E2 at low Bishop Score**

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**Abstract**

**Background:** The stimulation of uterine contractions prior to the spontaneous the start of labor, with or without ruptured membranes, is the definition of inducing of labor. The bishop scoring system is based on a digital cervical exam of a patient with a zero-point minimum and 13 points maximum.

**Objectives:** In order to determine the impact of prostaglandin E2 (PGE2) on the mode of delivery as a method of induction of labor in cases with low Bishop Score, identify possible predictors of successful vaginal delivery and investigate the delivery outcome in women who will have vaginal PGE2 for induction of labor.

**Patients and methods:** Prospective study on 60 pregnant women at Qena University Hospital from March 2022 to March 2023. Methods: Medical history, pelvic examination, obstetric ultrasound, NST, and cervical ripening with prostaglandin E2. Investigations: Urinalysis, CBC, coagulation profile.

**Results:** There were strong significant negative correlations between vaginal delivery and Induction to delivery interval  $p < 0.0001$ . 2 patients had fever, one patient had nausea, one patient had vomiting and one patient had diarrhea. 5 patients had Neonatal intensive care unit admission. 2 patients had Respiratory Distress Grade 1. 3 patients had Respiratory Distress Grade 2. One patient had complete cervical tear. One patient had perineal tear. One patient had blood transfusion.

**Conclusion:** Safe and successful labor induction with PGE2 in low-risk pregnant women. Significant negative relationships were between vaginal delivery and bishop score, gestational age, and induction to delivery interval.

**Keywords:** Perinatal outcome; Prostaglandin E2; Bishop Score.

**DOI:** 10.21608/SVUIJM.2024.274882.1822

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**Received:** 1 March, 2024.

**Revised:** 20 March, 2024.

**Accepted:** 25 March 2024.

**Published:** 18 January, 2025

**Cite this article** as Abd El-Naser Abd El-Gaber Ali, Mahmoud Ibrahim Almolakab B Alrashedy, Ibrahim Muhammad Ibrahim Gad , Hazem Hashem Ahmed.(2025). Perinatal Outcome of Vaginal Delivery induced by Prostaglandin E2 at low Bishop Score. *SVU-International Journal of Medical Sciences*. Vol.8, Issue 1, pp: 117-125.

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## Introduction

Stimulation of uterine contractions prior to the spontaneous start of labor, with or without ruptured membranes, is the definition of induction of labor. Labor induction frequently begins with cervical ripening, a procedure that typically utilizes prostaglandins to relax & dilate the cervix when it is closed and uneffaced (Waters et al., 2014).

Labor induction facilitated by prostaglandin E2 (PGE2) has the dual benefit of stimulating myometrial contractility & stimulating cervical ripening. Elective inductions, premature rupture of membranes ("PROM"), & post-date pregnancy are frequent indications for induction of labor (Cunningham et al., 2014).

Edward Bishop established in 1964 a set of criteria for elective induction of labor, which included patient consent, obstetric history, parity, gestational age, embryonic presentation, & obstetric history. Additionally, he devised a scoring system for the cervix to aid in the prediction of successful induction of labor. The bishop score, also referred to as the pelvic scoring system, continues to be a significant determinant in predicting the efficacy of labor induction (Hamm et al., 2019; Coviello et al., 2019; Gobillot et al., 2018).

The degree of dilation of the cervix is quantified in centimeters during cervical dilation. For this, the mean diameter of the cervix in an open position is estimated. The thinning or shortening of the cervix, indicated as a percentage of the total cervix, is termed effacement. When effacement is zero percent, the cervix is at its pre-labor length. fifty percent effaced; the cervix is at its minimum expected length. A cervix that is completely effaced resembles paper thin (Hamm et al., 2019).

This study's objective was to determine the impact of prostaglandin E2 (PGE2) on the mode of delivery as a method of induction of labor in cases with low Bishop Score, identify possible predictors of successful vaginal delivery and investigate the delivery outcome in women who will have vaginal PGE2 for induction of labor.

## Patients and methods

This was Prospective research performed on 60 pregnant females at Obstetrics & Gynecology Department, Qena University Hospital, South Valley University from March 2022 to March 2023. **Ethical code:** SVU/MED/OBG024/1/22/3/372.

**Inclusion criteria:** Singleton pregnancy, Full term pregnancies (41 weeks), Bishop Score <5 and Cephalic presentation.

**Exclusion criteria:** Malpresentation, Macrosomia, Soft tissue obstruction as placenta previa and low corporeal fibroid, Severe Intra Uterine Growth Restriction (IUGR), Previous uterine scar, Severe oligohydramnios, Cephalopelvic Disproportion (CPD), Abnormal NST or abnormal Doppler findings, Morbid obesity and bishop scoring (Wormer., 2017).

## Methods and techniques

**All patients were subjected to the following:** Full complete medical history: Personal history, associated co-morbidities, Conception, Previous history of Preeclampsia toxemia (PET), history of medications, IUGR in previous pregnancy, Gestational age in weeks and Pregnancy interval. As well as General examination and Systemic examination. Obstetric examination was done through general inspection, abdominal inspection and Palpation.

**Pelvic examination:** The pelvic examination involves palpating the cervix, assessing the Bishop score,

and performing an obstetric ultrasound.

4. Antibiotic prophylaxis in the form of first-generation cephalosporin was given and repeated every 8 hours to guard against infection. Dinoglandin E2 3 mg (Hephny pharma group-HPG) (1 vaginal tablet) was placed vaginally in the posterior fornix every 6 hours for a maximum of 4 doses after sterilization of vagina and insertion of suppository with sterilized gloves. Patients are monitored for changes in maternal and fetal vital manifestations, and progress of labor is recorded at portogram throughout the examination.

#### **Investigations**

All patients were undergoing the following investigations: Obstetric examination, Obstetric ultrasound and vaginal delivery induced by prostaglandin E2.

Complete urine analysis, full routine laboratory tests: Complete blood count and Coagulation profile.

#### **Procedure of vaginal delivery induced by prostaglandin E2**

##### **Cervical**

##### **Ripening:**

Prostaglandin E2 medication is used to soften and dilate the cervix, preparing it for labor if the patient's cervix is not yet favorable for labor. **Monitoring:** Following the administration of prostaglandin E2, the patient underwent monitoring to assess their body response and labor progress, including fetal heart rate and contractions. **Uterine Contractions:** Prostaglandin E2 stimulates uterine contractions, aiding in labor progression, pushing the baby

downward, leading to cervical dilation and effacement. **Labor Progression:** As the cervix continues to dilate and the contractions become more regular and intense, patient will transition into active labor. Closely monitor patient's progress and the baby's well-being throughout this phase. **Birth:** Once patient's cervix was fully dilated and effaced, patient entered the second stage of labor, which involves pushing and delivering the baby.

#### **Outcome measures**

**Primary outcome:** The patient's cervix is fully dilated and effaced, allowing them to enter the second stage of labor, which involves pushing and delivering the baby. **Secondary outcome:** The induction delivery interval, Neonatal outcome (Apgar scores at one & five minute) and admission to NICU.

#### **Statistical analysis**

The Statistical Package for the Social Sciences (SPSS) software program (version 26) was utilized to manage and analyze the data. The frequencies and percentages of qualitative variables were documented and compared using the chi-square test. Median and range were utilized to arrange ordinal variables. A value is deemed significant when the corresponding P value is 0.05 or less.

#### **Results**

(Table.1) presents demographic data of 60 patients, revealing a mean age of  $25.83 \pm 5.73$  years and median parity of 2 in which ranged from 1 to 4

**Table 1. Demographic data (60 patients)**

<b>Age Year (Mean <math>\pm</math>SD)</b>	25.83 $\pm$ 5.73
<b>Parity median(Min-Max)</b>	2(1 – 4)

In (Table.2), the Bishop score and gestational age of the same cohort showed median values of 5 in which

ranged from 3 to 6 and  $40.13 \pm 0.35$  weeks, respectively.

**Table 2. Bishop score and Gestational age (60 patients)**

Bishop score median(Min-Max)	5(3 - 6)
Gestational age Weeks (Mean $\pm$ SD)	$40.13 \pm 0.35$

(Table.3) indicates the mode of delivery, with 58.33% undergoing vaginal delivery and 41.67% having cesarean section. Among these, 22

patients experienced cesarean due to failed progress, while 3 underwent the procedure due to fetal distress.

**Table 3. Mode of delivery data**

Variables	N	%
Vaginal	35	58.33
Cesarean section	25	41.67

Analysis in (Table.4) demonstrates a significant difference ( $p = 0.008$ ) in the induction to delivery

interval between vaginal delivery ( $11.51 \pm 2.37$  hours) and cesarean section ( $14.28 \pm 1.4$  hours) groups.

**Table 4. Induction to delivery interval**

Hours (Mean $\pm$ SD)			
Vaginal (35 patients)	Cesarean section (25 patients)	Total (60 patients)	P value
$11.51 \pm 2.37$	$14.28 \pm 1.4$	$12.67 \pm 2.43$	0.008

P value < 0.05 is significant, P value < 0.01 is highly significant

In (Table. 5), the mean dose of prostaglandin E2 vaginal insert

administered was found to be  $10 \pm 0.67$  mg among 60 patients.

**Table 5. Doses of prostaglandin E2 (dinoprostone)**

(60 patients)	
Vaginal insert (mg) (Mean $\pm$ SD)	$10 \pm 0.67$

(Table.6) highlights side effects reported among 60 infants, including fever (3.33%), vomiting

(1.67%), diarrhea (1.67%), and nausea (1.67%) following prostaglandin E2 administration.

**Table 6. Side effects and complications of prostaglandin E2**

(60 infant)	N	%
Fever	2	3.33
vomiting	1	1.67
diarrhea	1	1.67
nausea	1	1.67

Fetal outcomes in (Table.7) show that 60% were female and 40% were male. Additionally, 8.33% of infants required neonatal intensive care unit admission, with 5% experiencing

respiratory distress grade 1 and 5% grade 2. Instances of complete cervical tear, perineal tear, and blood transfusion were also recorded, each at 1.67%.

**Table 7. Fetal and maternal outcome**

(60 infant)	N	%
Female	36	60.00
Male	24	40.00
Neonatal intensive care unit admission	5	8.33
Respiratory distress Grade 1	2	3.33
Respiratory distress Grade 2	3	5.00
Complete cervical tear	1	1.67
perineal tear	1	1.67
Blood transfusion	1	1.67

Correlations analysis in (Table.8) revealed a strong negative correlation between vaginal delivery and the induction to delivery interval (r = -0.495, p < 0.0001). However, no

significant correlations were found between successful induction and Bishop score (r = 0.198, p = 0.1) or gestational age (r = 0.160, p = 0.36).

**Table 8. Correlations between vaginal delivery and different parameters**

Correlations		
		Successful induction
Induction to delivery interval	r	-0.495**
	P	<0.0001
Bishop score	r	0.198
	P	0.1
Gestational age	r	0.160
	P	0.36

P value< 0.05 is significant, P value< 0.01 is highly significant

**Discussion**

A technique used to induce labor (IOL) and facilitate vaginal delivery when the risks associated with carrying on with the pregnancy for the mother or child are greater than the risks of delivery. Although it is commonly administered during high-risk pregnancies, the ARRIVE trial demonstrated that it can

also be advantageous in low-risk populations (Grobman et al., 2018).

As regards demographic data including age and parity. We found that mean age was 25.83 ± 5.73 and mean parity was 1.51± 1.24.

Our research is consistent with that of Navve et al. (2017) whose objectives were to determine whether the bishop-

score can be used to predict the efficacy of labor induction in multiparas & to examine the bishop-score's impact on maternal & neonatal outcomes. They found that 383 women had a low Bishop-score (Bishop-score <6) with mean age  $33.5 \pm 5.1$  and mean parity  $2.8 \pm 1.0$ .

In addition, our research agreed with that of **Anh et al. (2022)** whose objective was to assess the safety and efficacy of vaginal slow-release dinoprostone (prostaglandin E2 10 mg) in inducing labor in low-risk pregnant females. The researchers documented the age & parity of the 102 cases who were administered vaginal dinoprostone inserts for labor induction in the present investigation as baseline characteristics. They found that the median age (interquartile range) 27 (25 – 30).

Regarding parity they found that 67 (65.7%) Nulliparous and 35 (34.3%) Multiparous.

According to Bishop Score and Gestational age, our results showed that the mean bishop score was  $4.73 \pm 0.45$  and the mean gestational age was  $40.13 \pm 0.35$ .

Our research is consistent with that of **De Bonrosto et al. (2019)** whose objective was to compare the safety and efficacy of vaginal dinoprostone insert & low-dose protocol of vaginal misoprostol for inducing labor in post term pregnant females. For analysis, their research contained 198 women (99 women in each group). The median gestational age of the females in the dinoprostone group was 41.7 weeks, & the median Bishop score (interquartile range: 3) was 3 (2-4).

Furthermore, our research matched with that of **Geethanjali et al. (2022)** whose objective was to assess and compare the safety, effectiveness, & case satisfaction of prostaglandin gel and a single Foley catheter as induction techniques for pregnant women with

an unfavorable cervix. Ninety women, ranging in gestational age from 37 to 42 weeks, participated in their study; ninety were assigned to the PGE2 group & the remaining ninety to the foley's group. According to their findings, the average bishop score for the PGE2 group was  $3.36 \pm 1.56$ .

We found that 35 patients had vaginal delivery and 25 patients had cesarean section regarding mode of delivery.

Our study can be supported by **Anh et al. (2022)**. They found that 69 patients had vaginal delivery and 33 patients had cesarean section.

Also, our study agreed with **Obeidat et al. (2021)** who aimed to investigate the relevant factors for vaginal delivery among Jordanian women with prostaglandin-induced labour. Their study included 530 pregnant women. They found that 332 females (62.6%) had vaginal delivery and 198 women (37.4%) had caesarean section.

We found that according to induction to delivery interval the mean was  $11.51 \pm 2.37$  in patients with vaginal delivery,  $14.28 \pm 1.4$  in patients with cesarean section and  $12.67 \pm 2.43$  in total population. Our results demonstrated a statistically significant distinction among the two groups.

In addition, **Tseng et al. (2020)** whose objective was to assess the effects of a ten milligrams dinoprostone vaginal insert trigger on the prognosis of women carrying full-term pregnancies. A total of sixty-five females participated in their study; of these, fifty-three had successful vaginal deliveries and twelve had unsuccessful ones. It was observed that the time between PGE2 induction & delivery was considerably reduced in the group that achieved successful vaginal delivery as compared to the group that failed to deliver.

In our results, we revealed that mean dose of PGE2 vaginal insert was  $10 \pm 0.67$ .

Consistent with our findings, **Zhao et al. (2019)** conducted research in a tertiary maternity hospital in China with the objective of identifying relevant factors associated with vaginal delivery between females who performed labour induction via vaginal dinoprostone (PGE2) insert. It was discovered that to induce labour, a Dinoprostone vaginal insert (ten milligrams, Propess, Ferring, & Saint-Prex, Switzerland) was inserted into the posterior vaginal fornix. Re-administer the dose if the cervix remained unfavourable (Bishop Score  $\leq 6$ ).

In our study, regarding side effects and complications of prostaglandin E2, we found that there were 2 patients had fever. One patient had allergic reactions. One patient had vaginal bleeding.

On the contrary to our findings, **Jain et al. (2017)** investigated with the objective of investigating the impact of prostaglandins E1 & E2 on labour duration and assessing the obstetrical and neonatal outcomes associated with labour induction. nausea and vomiting were identified as the prevailing adverse effects documented in their research.

We found that fetal sex in 36 patients was females. 24 patients were males. 5 patients had Neonatal intensive care unit admission. 2 patients had Respiratory distress Grade 1. 3 patients had Respiratory distress Grade 2. One patient had complete cervical tear. One patient had perineal tear. One patient had blood transfusion.

We found that according to induction to delivery interval the mean was  $11.51 \pm 2.37$  in patients with vaginal delivery,  $14.28 \pm 1.4$  in patients with cesarean section and  $12.67 \pm 2.43$  in total population. Our

results showed a statistically significant difference between the two groups.

In addition, **Tseng et al. (2020)** whose objective was to assess the effects of a ten milligrams dinoprostone vaginal insert trigger on the prognosis of women carrying full-term pregnancies. A total of sixty-five females participated in their investigation; of these, fifty-three had successful vaginal deliveries and twelve had unsuccessful ones. It was observed that the time between PGE2 induction & delivery was considerably reduced in the group that achieved successful vaginal delivery as compared to the group that didn't.

In our results, we revealed that mean dose of PGE2 vaginal insert was  $20 \pm 5.2$ . Mean dose of PGE2 gel formulation was  $2.5 \pm 0.5$ .

Consistent with our findings, **Zhao et al. (2019)** conducted research in a tertiary maternity hospital in China with the objective of identifying pertinent factors associated with vaginal delivery between female who performed labor induction via vaginal dinoprostone (PGE2) insert. It was discovered that in order to induce labor, a Dinoprostone vaginal insert (ten milligrams (Propess, Ferring, Saint-Prex, Switzerland) was inserted into the posterior vaginal fornix. If the condition of the cervix remained adverse (Bishop Score  $\leq 6$ ), the dosage was applied.

In our study, regarding side effects and complications of prostaglandin E2, we found that there were 2 patients had fever, one patient had nausea, one patient had vomiting and one patient had diarrhea

On the contrary to our findings, **Jain et al. (2017)** conducted a study with the objective of investigating the impact of prostaglandins E1 and E2 on labour period and assessing the obstetrical and neonatal outcomes

associated with lab induction. They disclosed that vomiting and nausea were the most frequently observed adverse effects in their research.

We found that fetal sex in 36 patients was females. 24 patients were males. 5 patients had Neonatal intensive care unit admission. 2 patients had Respiratory distress Grade 1. 3 patients had Respiratory distress Grade 2, One patient had complete cervical tear and One patient had perineal tear. One patient had blood transfusion.

**Geethanjali et al. (2022)** reported that one quarter of all neonates were admitted to the NICU for many reasons like respiratory difficulties, and jaundice requiring phototherapy.

Moreover, in their study, **Zhao et al. (2019)** intended to examine the pertinent variables that might influence the duration between induction & vaginal delivery during the usage of a dinoprostone vaginal insert for cervical ripening & induction of labour. The research team comprised 1265 female participants who were induced into labour using a vaginal dinoprostone (PGE2) insert. Fourteen cases were discovered to have been admitted to the NICU.

According to correlations between vaginal delivery and different parameters including bishop score, gestational age and induction to delivery interval. We found that there were strong significant negative correlations between vaginal delivery and induction to delivery interval.

Furthermore, **Zhao et al. (2019)** observed that women who had obstetric complications, a brief gestational age, multipar parity, & small neonates as measured by BPD & foetal weight had a reduced induction to delivery time interval (all  $P < 0.01$ ). Conversely, no statistically significant correlations were observed

among those factors and the duration from induction to delivery.

### Conclusion

Safe and effective, PGE2 was utilized to induce labor in low-risk pregnant females. According to correlations between vaginal delivery and different parameters including bishop score, gestational age and induction to delivery interval, there were strong significant negative correlations between vaginal delivery and induction to delivery interval.

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