

Bishop Score and the Risk of Cesarean Delivery after Induction of Labor in Nulliparous Women

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Abstract

Background: Induced labour has an impact on the birth experience of women. It still carries the risk of cesarean delivery compared with spontaneous labour especially for nulliparous women with unfavorable cervix.

Objective: To assess the risk and the risk factors for cesarean delivery associated with induction of labor in nulliparous women in relation to bishop score.

Design: An interventional study in AL-Khadimia Teaching Hospital.

Methods: A group of 198 nulliparous pregnant women with a term singleton fetus in cephalic presentation scheduled for induction participated in this study. Indications and bishop scores were recorded before labor induction. Obstetric and neonatal data were analyzed and compared with the results in women with a low Bishop score. Data were analyzed using univariate and multivariable regression modeling.

Results: The cesarean delivery rate in women undergoing labor induction was 46.96%, for Bishop Score ≤ 4 cesarean section (C/S) rate was 29.79%, and for Bishop Score ≥ 5 cesarean section (C/S) rate was 14.64%. After adjusting for the Bishop score at admission, Bishop score of 4 or less was a predominant risk factor for a cesarean section (C/S), the degree of cervical dilatation and station of the presenting part was the most significant parameter for risk of cesarean section (C/S). Other variables with significantly increased risk for cesarean delivery included maternal age of 30 years or older and birth weight of 3.500 gm or higher, gestational age of more than 41-42 weeks.

Conclusion: Induction of labor in nulliparous women at term with a singleton fetus in cephalic presentation is associated with an increased risk of cesarean delivery predominantly related to an unfavorable Bishop score at admission.

Keywords: Induction of labor, Bishop Score, risk of cesarean delivery.

Introduction:

Induction of labour can be defined as the artificial initiation of labour, before its spontaneous onset, for the purpose of delivery of the fetoplacental unit. Prostaglandins and Oxytocin are the principal hormones which can both be produced synthetically and be given to pregnant women to induce labour.

According to the National Center for Health Statistics, the annual incidence of labor induction or augmentation in the United States almost doubled from 9.5 percent in 1991 to 22.5 percent in 2006. By comparison at the University of Alabama at Birmingham Hospital, labor is induced in about 20 percent of women, and another 35 percent are given Oxytocin for augmentation a total of 55 percent.⁽¹⁾ Over the past few years, there has been increasing awareness that if the cervix is unfavorable, a successful vaginal birth is less likely, therefore in the face of a situation indicating pregnancy interruption⁽²⁾. In the sixties, Bishop published the result of a study establishing labor induction prognosis through the assessment of five specific factors determined during vaginal examination: cervix dilation, effacement, consistency, position of the cervix and fetal descent. Values from zero to two for cervix consistency and position, from zero to three for the other factors are attributed.⁽³⁾

The duration of the labor is inversely correlated with the Bishop score; a score that exceeds 6 describes the patient most likely to achieve a successful vaginal birth. Bishop score of less than 6 usually requires that the cervical ripening method to be used before other methods⁽⁴⁾. Ultrasound

evaluation of the cervix is the second predictor; a recent randomized trial showed that the use of transvaginal ultrasound cervical length (TVU CL) instead of Bishop Score for management of induction is associated with a decreased need for intracervical prostaglandin treatment without adverse effects on the success of the induction.^(5,6,7) Fetal fibronectin has been shown to be reasonable accurate and useful marker for physiologic process that occurs in the uterus and the cervix in the preparation for spontaneous onset of labor.⁽⁶⁾ Generally labor induction is indicated when the benefit of delivery to the mother or the fetus outweigh the potential risk of continuing the pregnancy^(8,9).

Of the most standard indications of labor induction, pregnancy induced hypertension and prolonged pregnancy are among the most common accounting for more than 80% reported inductions⁽⁸⁾. Induction of labor is by either pharmacological (Oxytocin, Prostaglandin) and/ or mechanical (membrane stripping, mechanical and hygroscopic dilators, acupuncture, amniotomy).⁽⁸⁾

Induction of labor can be complicated by failure which occurs in up to 35% of cases induced with Oxytocin alone and 3-5% of cases in which PG have been used, cord prolapsed and abruption⁽⁷⁾. Complication increased Cesarean delivery rate, Chorioamnionitis, hyponatremia, uterine hyperstimulation, postpartum hemorrhage⁽²⁾, fetal prematurity and hyperbilirubinemia.⁽¹⁾

Aim of the study:

To assess risk factors for cesarean delivery associated with induction of labor in nulliparous women in relation to bishop score.

Patients and methods:

An interventional study carried out at the department of obstetrics and gynecology in al - Khadimia Teaching hospital- Baghdad- Iraq from first of May 2009 till end of June 2010.

During the study period 3240 pregnant women admitted to the labour ward, 198 of them were nulliparous pregnant women with singleton fetus in cephalic presentation were admitted for induction of labour for different indications all of them included in the study.

Multiple gestations, fetal anomalies, malpresentation or transverse lie, preterm deliveries (<37 weeks), elective cesarean deliveries for medical or obstetric reasons and patients with Failed inductions were excluded from the study.

At admission to the labour ward, specific data including maternal age, history of previous abortion, and the indication for induction was recorded. Gestational age was assessed by the last menstrual period (LMP) when accurate or dependable early US report when LMP in doubt. The US date is taken if the discrepancy in the estimated date of the delivery (EDD) calculated from US and the date of LMP is >10 days.

Patient consent obtained before starting induction.

Pelvic examination and bishop score assessed at admission by senior house officer.

Depending on bishop score at admission we decided which method of induction should be used. The modified bishop score was calculated (cervical dilatation 0 - 3 point, effacement 0 - 3 point and fetal station 0 - 3 point), from the first vaginal exam before labour induction or any method of cervical ripping used.

Labour induction in patients with a favorable cervix (modified bishop score ≥ 5 or a cervical dilatation ≥ 2 cm) was done by amniotomy followed with oxytocin infusion (1 μ u /min increased by 1-2 μ u/min every 20 -30 min).

For patients with an unfavorable cervix (bishop score of ≤ 4), Labour induction started with prostaglandins as priming agent as follow:-

1- Prostaglandin E1 (misoprostol) in form of 25 μ g /6hr vaginal tablet.

2- Prostaglandin E2 vaginal tablet (3 mg) between 1 and 3 doses at interval of 6-8 hr to maximum of 6 mg

Until the cervix became favorable (bishop score >6) it is usually possible after this to perform an artificial rupture of membranes (ARM) and then to commence oxytocin after (6-8 hr) if the contractions are still poor.

Patients with prolonged rupture of membranes (> 12-24 hr) underwent labour induction using intravenous oxytocin regardless of the cervical status.

Induction is said to have failed if an ARM is still impossible after the maximum number of doses of prostaglandin have been given or if the cervix remain un effaced and <3cm dilated after an ARM has been performed and syntocinon has been running for 6-8 hr. Patients with failed inductions were delivered by C/S.

Statistical analysis:

Statistical analysis was performed using SPSS. Univariate analyses included the X^2 test and analysis of variance, followed by Scheffe' test for differences between groups. Known prognostic variables were included in a multivariable logistic regression analysis. A final model of risk factors for cesarean delivery was created using the maximum likelihood estimation ($P < 0.5$). Adjusted odds ratios (ORs) were reported for the variables that were statistically significant.

Results:

As shown in table (1) .Mean maternal age was 25.87 years ranging between (18-40) years. Mean gestational age was 38.53 week ranging between (37-42) weeks. Induced women were with bishop score mean 4.96 range between (3-10). Mean dilatation was 1.22 cm range (0-5) cm and mean effacement was 1.73 ± 0.12 while range of station was (-3 to -1) with a mean -1.94 ± 0.02 .

According to the indication of induction of labour we subdivided the women into those with maternal indications which was (15.15%) and for fetal indications was (25.75%).

46.96% of induction done for advanced gestation age and (12.12%) for prolonged rupture of membrane . according to the bishop score at admission there was significant difference in C/S rate ;for patient with bishop score ≤ 4 C/S rate was (29.97%), for bishop score 5-8 (14.64 %), and for bishop score ≥ 9 (2.52%) P value 0.007, as shown in table (2) the C/S rate was significantly related to bishop score at admission which was higher for bishop score ≤ 4 .

Mean birth weight was 3.27 kg, C/S rate was (46.96%) and rate of instrumental vaginal delivery was (17.16%) as shown in table (3).

In multiple logistic regression for risk of C/S, dilatation and station was significant risk factor for C/S P value 0.021 and 0.002 respectively, while effacement was not significant risk factor for C/S P -value 0.3, as shown in table (4) Dilatation and station but not effacement were significant risk factor for C/S. After inclusion bishop score at admission in multivariable regression model for risk of C/S bishop score ≤ 4 was significant risk factor for C/S, the other independent significant risk factors for C/S were maternal age, gestational age and birth weight, as shown in table (5) Bishop score ≤ 4 was

significant risk factor for C/S in addition to maternal age, gestational age and birth weight. The most common indication for induction of labour was advanced gestational age and fetal causes.

Table (1): Characteristics of the study population at admission:-

	Mean ±SD	Range
Maternal age (y)	25.87± 5.74	18-40
Gestational age (W)	39.53±1.87	37-42
37-37 ⁺⁶	42(21.21%)	
38-38 ⁺⁶	27(13.63%)	
39-39 ⁺⁶	36(18.18%)	
40-40 ⁺⁶	63(31.81%)	
41-42	30 (15.15%)	
Bishop score	4.96±0.35	3-10
Dilatation	1.22±0.03	0-5
Effacement	1.73±0.12	0-2
Station	-1.94±0.02	-3 to -1
Indications for induction		
Maternal	30 (15.15%)	
Fetal	51(25.75%)	
Advanced GA	93(46.96%)	
Prolonged rupture membrane	24(12.12%)	

As shown in table (2) the C/S rate was significantly related to bishop score at admission which was higher for bishop score ≤ 4 .

Table (2): Mode of delivery in relation to Bishop Score

Bishop score	Vaginal delivery	C/S	Total
≤ 4	43(21.71%)	59 (29.79%)	102
5-8	52 (26.26%)	29 (14.64%)	81
≥ 9	10 (5.05%)	5 (2.52%)	15
Total	105(53.03%)	93 (46.96%)	198
p-value	0.007 Significant		

Table (3): Characteristics of labor:

Birth weight	No. (%)
2.5-3	72(36.36%)
3-3.5	43(21.71%)
3.5-4	50(25.25%)
4-4.5	33(16.67%)
Mean (+SD)	3.27+0.66
Cervical dilatation	No. (%)
0	90(45.45%)
1-2	68(34.34%)
3-4	40(20.20%)
>5	0(0%)
Mean +SD	1.22+0.03
Cervical length	No. (%)
>2	83(41.91%)
2-1	76(38.38%)
1-0.5	26(13.13%)
<0.5	13(6.56%)
Mean +SD	1.73+0.12
Station	No. (%)
-3	47(23.73%)
-2	93(46.96%)
-1	58(29.29%)
+1,+2	0(0%)
Mean +SD	-1.94+0.02
Mode of delivery	No. (%)
Spontaneous	71(35.85%)
Vacuum	27(13.63%)
Forceps	7(3.53%)
C/S	93(46.96%)

As shown in table (4) Dilatation and station but not effacement was significant risk factor for C/S.

Table (4): Multiple logistic regression for the risk of C/S

	C/S No.	Vaginal delivery No.	p-value
Dilatation			
0	45	45	P=0.021 Significant
1-2	28	40	
3-4	0	40	
>5	0	0	
Cervical length			
>2	43	40	P=0.321 Non-significant
2-1	36	40	
1-0.5	16	10	
<0.5	6	7	
Station			
-3	37	10	P=0.002 Significant
-2	23	70	
-1	10	48	
+1,+2	0	0	

As shown in table (5) Bishop Score ≤ 4 was significant risk factor for C/S in addition to maternal age, gestational age and birth weight.

Table (5): Adjusted odds ratio for a Cesarean Delivery after including the Bishop score at admission in the multiple logistic regression model.

Risk factor	Adjusted OR (95% CI)
Maternal age	
≤ 19	1.32 (1.22-1.04)
20-24	0.94 (0.66-1.34)
25-29	0.94 (0.51-1.73)
30-34	1.54 (1.41-1.68)
≥ 35	1.66 (0.67-2.22)
Bishop score	
≤ 4	2.04 (1.48-2.82)
≥ 5	1.0
Birth weight	
2.5-3	1.23 (1.01-1.73)
3-3.5	1.56 (1.0-1.78)
3.5-4	1.0
4-4.5	1.55 (1.33-2.31)
4-4.5	1.99 (1.01-2.76)
Gestational age	
37-37 ⁺⁶	0.46 (0.15-0.68)
38-38 ⁺⁶	0.66 (0.42-0.87)
39-39 ⁺⁶	0.56 (0.35-0.89)
40-40 ⁺⁶	0.85 (0.46-1.22)
41-42	1.1

Discussion:

Induction of labor is a major intervention in the normal course of pregnancy with the potential to set in motion a cascade of interventions particularly cesarean section and assisted delivery, it may be less efficient and is usually more painful than spontaneous labor.⁽¹⁾

In this study, when Bishop Score included as an extra co-variable in the multivariable regression model with gestational age, maternal age and birth weight, there was significant increase in cesarean delivery rate predominantly related to unfavorable bishop score at admission.

The degree of cervical dilatation and station of the presenting part, rather than cervical length can be considered as predictors for risk of cesarean delivery, therefore a bishop score at admission of 4 or lower and not the induction per se is associated with a more than double risk in cesarean delivery rate regardless of the causes of induction. Induced women with a low bishop score, the cesarean delivery rate was 29.79 versus 14.64 for women with more favorable bishop score.

This is in agreement with a study of Alexander et al (2000) who evaluated 4931 nulliparous women induced for post term pregnancy at parkland hospital for a period of 10 years, they reported that women in whom there was no cervical dilatation had a twofold increased cesarean delivery rate.⁽¹⁰⁾

Several authors Hoffman et al (2003), Maslow et al (2000) and Smith et al (2003) found that induction

of labour in Nulliparous women was associated with an increase in cesarean delivery.^(11, 12, 13)

This is in contrast to study of Nathan Rojansky et al, Macer et al, Votta RA et al which shows that induction of labour in 67 nulliparous women from a total of 210 when medically or obstetrically indicated is not associated with an increased risk of cesarean delivery, instrumental delivery and favorable outcome for induction of labour both in low and high risk pregnancies.^(14, 15, 16)

This is in contrast to the study of Mercer et al and Hamar et al they found that pre-induction cervical ripening may not lower the cesarean delivery rate in a nulliparous with an unfavorable cervix.^(17, 18)

This discrepancy may be explained by other methods used for cervical ripening such as labour initiation by prostaglandins, improved fetal surveillance, and liberal use of analgesia along with more active approach to treatment of labour disorders which have been increasingly used during the last two decades.

Recently several authors found that Bishop score was independent factor for successful induction of labour (IOL), Tan PC et al, evaluate digital examination for Bishop score assessment in 249 women, of them 108 were nulliparous women undergoing labor induction at term to assess their tolerability and their ability to predict the need for cesarean delivery, They conclude that bishop score was a useful predictor for cesarean delivery following failed labor induction.⁽¹⁹⁾

At 2007, Yanik et al, explore the value of Bishop score measurements, in addition to gestational age, maternal age, parity, and weight of the newborn in predicting the mode of delivery in pregnancies in which labor is induced with oxytocin at or beyond 40 weeks in 73 nulliparous pregnant women, They found that the Bishop Score and weight of the newborn were significant independent predictors for the route of delivery.⁽²⁰⁾

In our study the bishop score was assigned only by digital examination and not prospectively determined by US this could be a possible limitation of this study.

Beuno et al, at 2007 reanalyze the clinical and sonography variables that predict the success of labor induction in 50 nulliparous from a total of 196 women in prediction of successful vaginal delivery within 24 hours of induction and found that the Bishop score, parity and cervical length provide independent variables in prediction of vaginal delivery within 24 hour of the induction.⁽²¹⁾

Hatfield et al, at 2007, performed a meta-analysis of 20 trials in which cervical length was assessed by transvaginal sonography and was found to be not superior to the bishop score.⁽²²⁾

Again Park K.H. at Seoul National University Bundang Hospital in 2007 assess 161 nulliparous women scheduled of labor induction underwent TVS

cervical length and digital cervical examination he demonstrates that cervical length, gestational age at induction but not Bishop score significantly and independently predicted failed labor induction.⁽²³⁾

In the present study cesarean delivery rate was significantly related to maternal age, the higher the maternal age the higher the risk of cesarean delivery. In line with our observation several authors Maslow AS et al, Johnson DP et al, Heffner LJ et al, and Ecker JL et al. found that cesarean delivery risk increased with older maternal age and higher birth weight, induction without stated risk factors may not carry an increased risk of cesarean delivery.^(12, 24, 25, 26)

Birth weight of 3.500 g or higher was associated with an increased cesarean delivery rate, this is similar to meta analysis of observational studies conducted by Sanchez-Romas et al, Johnson DP et al, Prysak M et al in which women with suspected fetal macrosomia were managed expectantly or underwent labor induction, perinatal outcomes were similar, however, the cesarean delivery rate was significantly lower with expectant management compared with that of induction 8.4 versus 16.6 percent.^(24,27,28)

In the present study the most common indication for induction of labor is GA of 40 -41 weeks, many clinicians consider this diagnosis, especially at 41 weeks, to be within the normal range of term gestation and that induction of such women is considered elective and there was significant increase in risk of cesarean delivery odd ratio 0.85 after IOL with this gestational age and for gestational age 41 -42 weeks IOL was significantly associated with increased risk of cesarean delivery odds ratio 1.1 these result are in contrast to analysis of 19 trials in the Cochrane Pregnancy and Childbirth Trials Registry, Gulmezoglu et al 2006 found that induction after 41 weeks was associated with fewer perinatal deaths without significantly increasing the cesarean delivery rate.⁽²⁹⁾

Similar findings were reported by Mozurkewich et al 2009 in their review of 2 meta-analyses and a recent randomized controlled study.⁽³⁰⁾

Conclusion:

Induction of labor in nulliparous women at term with a singleton fetus in cephalic presentation is associated with an increased risk of cesarean delivery, predominantly related to an unfavorable Bishop score (≤ 4) at admission. So we recommend the nulliparous pregnant women with favorable bishop score (≥ 5) without other risk factors to be reassured about likelihood of successful induction of labour.

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