

Factors Affecting Labor Induction in Late-Term Pregnancies

Nuri Peker*, Ahmet Demir**, Zafer Bütün***, Alper Biler**, Savaş Gündoğan*

*Acıbadem Üniversitesi Tıp Fakültesi Atakent Hastanesi Kadın Hastalıkları ve Doğum Anabilim Dalı

**Tepecik Eğitim ve Araştırma Hastanesi Kadın Hastalıkları ve Doğum Kliniği

***Avcılar Devlet Hastanesi Kadın Hastalıkları ve Doğum Kliniği

ABSTRACT

Objective: We retrospectively evaluated the factors affecting labor induction success in the management of pregnancies at or beyond 41 weeks of gestation.

Material and Methods: Gestational and obstetric records of 113 patients delivered at or beyond 41 weeks of gestation were retrospectively reviewed.

Results: The rate of induced vaginal delivery was 93.1% (n=27) in patients with Bishop score ≥ 7 and 60.7% in patients with Bishop score < 7 (n=84) and was significantly higher in patients with Bishop score ≥ 7 (p=0.003; p<0.01). The rate of induced vaginal delivery was 79.7% in multiparous women and 57.4% in nulliparous women and the rate was significantly higher in multiparous women (p=0.019; p<0.05). The rate of induced vaginal delivery was 73.2% in patients with normal AFI and 43.8% in patients with oligohydramnios and the rate was significantly higher in patients with normal AFI (p=0.037; p<0.05). Apgar score was significantly higher in the infants of the patients with normal AFI compared to patients with oligohydramnios (p=0.008; p<0.01) and the rate of NICU admission was higher in patients with oligohydramnios than in patients with normal AFI (p=0.028; p<0.05).

Conclusion: Bishop score, parity, amniotic fluid index influence labor induction success in pregnancies at or beyond 41 weeks of gestation. Fetal distress and cesarean section rate was higher at patients with Bishop score < 7 who were nulliparous and with oligohydroamnios.

Keywords: induction, late-term, pregnancy

ÖZ

Geç Term Gebeliklerde Doğum İndüksiyon Başarısını Etkileyen Faktörler

Amaç: Kırk bir hafta ve üzeri gebeliklerin yönetiminde doğum indüksiyonu başarısını etkileyen faktörleri retrospektif olarak değerlendirdik.

Gereç ve Yöntem: Gebelik takibi ve doğumu yaptırılan 41 hafta ve üzeri gebelerin gebelik ve doğum kayıtları retrospektif olarak incelendi.

Bulgular: Bishop skoru 7 ve üzerinde olan gebelerde indüksiyon sonrası vajinal yolla doğum yapma oranı (%93,1), bishop skoru 7'nin altında olanlardan (%60,7) istatistiksel olarak anlamlı düzeyde yüksektir (p:0,003; p<0,01). Multipar gebelerde vajinal yolla doğum oranı (%79,7), nullipar gebeliklerden (%57,4) istatistiksel olarak anlamlı düzeyde yüksektir (p:0,019; p<0,05). Amniyon maisi normal olan gebelerde vajinal yolla doğum yapma oranı (%73,2), oligohidroamniosu olan gebelerden (%43,8) istatistiksel olarak anlamlı düzeyde yüksektir (p:0,037; p<0,05). Ek olarak amniyon maisi normal gebelerde yenidoğan APGAR skorları oligohidroamniosu olan gebelere göre istatistiksel olarak anlamlı düzeyde yüksektir (p:0,008; p<0,01) ve aynı gruptaki yenidoğanlarda yoğun bakım gereksinimi görülme oranı istatistiksel olarak anlamlı düzeyde düşüktür (p:0,028; p<0,05).

Sonuç: Kırk bir hafta ve üzeri gebeliklerde indüksiyon başarısını etkileyen faktörler arasında bishop skoru, parite ve amniyon mai miktarı bulunmaktadır. Bishop skoru 7'nin altında olan nullipar ve oligohidroamniyozu olan gebeliklerde fetal distres ve sezaryen ile doğum oranı artış göstermektedir.

Anahtar kelimeler: gebelik, geç term, indüksiyon

INTRODUCTION

Post-term pregnancy is defined as a pregnancy that persists ≥ 42 weeks of gestation (≥ 294 days) and late-

term pregnancy refers to a pregnancy that reaches between 41 and 42 weeks of gestation according to the last menstrual period (LMP) date ⁽¹⁾. According to the 2007 data on U.S. births, the pregnancies that re-

Alındığı Tarih: 22.09.2016

Kabul Tarihi: 24.02.2017

Yazışma adresi: Uzm. Dr. Nuri Peker, Merkez Mahallesi, Turgut Özal Bulvarı, 16-14A D: 52, Halkalı-K.Çekmece-34303-İstanbul
e-posta: dr.atal1980@hotmail.com

ach between 41 and 42 weeks of gestation constitute 14% of all pregnancies and the pregnancies that continue beyond 42 completed weeks of gestation account for 6% of all pregnancies⁽¹⁾. Epidemiological studies have shown that the pregnancies that continue at or beyond 41 weeks of gestation are associated with increased fetal, neonatal, and maternal complications^(1,2). Pregnancies that continue beyond 41 weeks of gestation lead to an increased risk for non-anomalous stillbirth and early neonatal death⁽³⁻⁵⁾. These pregnancies have also been shown to cause a number of fetal complications including intrauterine infection, placental insufficiency, umbilical cord compression, fetal hypoxia, asphyxia, and meconium aspiration, all of which may ultimately result in perinatal death⁽³⁻⁶⁾ and maternal complications including labor abnormalities, failed induction of labor, third- or fourth-degree perineal laceration, and postpartum hemorrhage^(4,5).

Induction of labor at 41-week of gestation can be performed by using mechanical or medical methods. In patients with a Bishop score of <7, cervical ripening agents are preferred⁽¹²⁾. It has been noted that the rate of successful labor induction is remarkably high in patients with a Bishop score of >7, whereas the rate of successful labor induction is low and the rate of cesarean delivery is remarkably high in patients with a Bishop score of <7⁽¹²⁾. It has also been shown that labor induction leads to an increased risk for cesarean delivery in patients with oligohydramnios (single deepest pocket <2 cm)^(15,16).

In this study, we aimed to evaluate the factors affecting the success of elective labor induction in patients with late-term pregnancy and to analyze the relationship between these factors and Apgar score and admission to NICU.

MATERIAL and METHODS

The retrospective study evaluated 113 patients that were admitted to Elazig Research and Training Hospital Gynecology and Obstetrics Department and were monitored and delivered at or beyond 41 weeks of gestation between 2011 and 2013. The patients that underwent antenatal testing for a minimum of 3 times were accepted as patients with serial antenatal testing and were included in the study. Gestational age of the infants was estimated based on the last menstrual peri-

od (LMP) date and was either confirmed or corrected by first- or second-trimester ultrasonography (USG) findings. These findings included crown-rump length (CRL), which was measured in the first-trimester ultrasonographic examination, and biparietal diameter (BPD), which was measured in the second-trimester ultrasonographic examination.

Depending on the LMP date, the pregnancies at or beyond 42 weeks (≥ 294) were accepted as post-term pregnancies and the pregnancies between 41 and 42 weeks were accepted as late-term pregnancies. The patients with a gestational age of 41 weeks or more were evaluated with USG and nonstress testing (NST) and then hospitalized at the obstetrics clinic. Fetal biometry and amniotic fluid were evaluated on USG, and fetal well-being was evaluated with NST. In the evaluation of amniotic fluid, amniotic fluid index (AFI) was measured by using the four-quadrant technique and oligohydramnios was defined as AFI <5 cm. During the first presentation, gynecologic examination for Bishop score was performed in each patient. Depending on the Bishop score, the patients were divided as patients with Bishop score <7 and ≥ 7 . Labor induction was initiated with the use of oxytocin in patients with Bishop score ≥ 7 and with the initial administration of vaginal 10 mg dinoprostone (Propess) in patients with Bishop score <7 in order to achieve cervical ripening. In the patients that initially received Propess, vaginal Propess was removed in the active phase of the labor and induction was initiated with oxytocin and oxytocin infusion was continued until delivery. All the patients underwent barium enema.

All the patients were evaluated for age, parity, number of deliveries and abortions, gestational age at delivery, mode of delivery, indications for cesarean delivery, infant birth weight, Apgar score, admission to NICU, and obstetric and postpartum complications (intrauterine growth restriction, oligohydramnios, prematurity, placental abnormalities, chromosomal anomalies, preeclampsia, placental detachment, stillbirth, and deep vaginal tear).

A written informed consent was obtained from each patient. The study protocol was approved by the local Ethics Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

All data were analyzed using IBM SPSS Statistics Version 22.0 (IBM SPSS, Turkey). Normal distribution of data was tested using Shapiro-Wilk test. Descriptive statistics including Mean, Standard Deviation, and Frequencies were used for the analysis of the data. Mann Whitney U test was used for comparing nonnormally distributed variables for two groups. Kruskal Wallis test was used for comparing nonnormally distributed variables for more than two groups and Mann Whitney U test was used for testing the difference in means. Qualitative data were compared by using chi-square test, followed by Yates Correction for Continuity and Fisher's Exact Test. A p value of <0.05 was accepted statistically significant.

RESULTS

Mean age was 26.5±5.48 years. Mean gravida was 2.22±1.57. Of the 113 women, 54 (47.8%) were nulliparous and 59 (52.2%) were multiparous. Mean parity was 1.01±1.21. Mean infant birth weight was 3,370.8±247.1 g. Mean Apgar score was 8.16±0.89 (Table 1). Bishop score was <7 in 84 (74.3%) and ≥7

Table 1. Clinical characteristics of the women.

	Min-Max	Mean±SD
Age (years)	16-40	26.5±5.48
Gravida	1-9	2.22±1.57
Parity	0-5	1.01±1.21
Infant birth weight (g)	2600-4100	3370.8±347.1
APGAR score	6-9	8.16±0.89
	n	%
Gravida		
Nulliparous	54	47.8
Multiparous	59	52.2
Bishop Score		
<7	84	74.3
≥7	29	25.7
Induction		
Propress+Induction	83	73.5
Induction	30	26.5
NST		
Reactive	91	80.5
Late Decelerations	22	19.5
Amniotic Fluid Index		
Normal	97	85.8
Oligohydramnios	16	14.2
Mode of Delivery		
Normal	78	69
Cesarean Section	35	31
Indications for		
Nonprogressive Labor	12	34.3
Cesarean		
Fetal distress	20	57.1
Section		
Meconium	3	8.6
Neonatal		
Non-required	99	87.6
Intensive Care		
Required	14	12.4
Unit (NICU) Admission		

in 29 (25.7%) women. Amniotic fluid index (AFI) was normal in 97 (85.8%) women and oligohydramnios was seen in 16 (14.2%) women (Table 1). Admission to NICU was not required in 99 (87.6%) neonates but 14 (12.4%) neonates were admitted to NICU (Table 1).

Table 2 presents the association between parity and mode of delivery, Apgar score, and admission to NICU. Induced vaginal delivery was performed in 79.7% (n=59) of multiparous women and in 57.4% (n=54) of nulliparous women. The rate of induced vaginal delivery was significantly higher in multiparous women (p=0.019; p<0.05). However, no significant correlation was found between parity and Apgar score and admission to NICU (p>0.05; p>0.05).

Table 2. Evaluation of pregnancy outcomes according to parity.

	Parity		p
	Nulliparous	Multiparous	
APGAR score, Mean±SD (median)	8.02±0.94 (8)	8.29±0.83 (8)	¹ 0.117
Mode of delivery, n (%)			
Normal	31 (57.4%)	47 (79.7%)	² 0.019*
Cesarean section	23 (42.6%)	12 (20.3%)	
NICU admission, n (%)			
Non-required	44 (81.5%)	55 (93.2%)	² 0.108
Required	10 (18.5%)	4 (6.8%)	

¹Mann Whitney U Test, ²Yates Correction for Continuity, *p<0.05

Table 3 presents the association between Bishop score and mode of delivery, Apgar score, and admission to NICU. Induced vaginal delivery was performed in 93.1% (n=27) of patients with Bishop score ≥7 (n=29) and 60.7% (n=51) of patients with Bishop score <7 (n=84). In addition, the rate of induced vaginal delivery was significantly higher in patients with Bishop score ≥7 compared to patients with Bishop score <7 (p=0.003; p<0.01). Although no significant

Table 3. Evaluation of pregnancy outcomes according to parity and bishop scores.

	BISHOP		p
	<7	≥7	
APGAR score, Mean±SD (median)	8.07±0.92 (8)	8.41±0.78 (9)	¹ 0.071
Mode of delivery, n (%)			
Normal	51 (%60.7)	27 (%93.1)	² 0.003**
Cesarean section	33 (%39.3)	2 (%6.9)	
NICU admission, n (%)			
Non-required	70 (%83.3)	29 (%100)	² 0.019*
Required	14 (%16.7)	0 (%0)	

¹Mann Whitney U Test, ²Yates Correction for Continuity and Fisher's Exact Test, *p<0.05, **p<0.01

correlation was found between Bishop Score and Apgar Score ($p>0.05$), the rate of NICU admission was significantly higher in women with Bishop score <7 ($p=0.019$; $p<0.05$).

Table 4 presents the association between AFI and mode of delivery, Apgar score, and admission to NICU. Induced vaginal delivery was performed in 71 (73.2%) out of 97 women with normal AFI and in 7 (43.8%) out of 16 women with oligohydramnios. The rate of induced vaginal delivery was significantly higher in patients with normal AFI compared to patients with oligohydramnios ($p=0.037$; $p<0.05$). Neonatal Apgar score was significantly higher in patients with normal AFI compared to patients with oligohydramnios ($p=0.008$; $p<0.01$). Moreover, the rate of NICU admission was significantly higher in patients with oligohydramnios compared to patients with normal AFI ($p=0.028$; $p<0.05$). Moreover labor induction success in patients with normal AFI is influenced by the Bishop score of the patients. In patients with Bishop score <7 induced vaginal delivery was performed in 45 (80.7%) of the patients with normal AFI and in 6 (40%) of the patients with oligohydramnios and a significant difference was established between these two groups.

Table 4. Evaluation of pregnancy outcomes according to Amniotic Fluid Index (AFI).

	AFI		p
	Normal	Oligohydramnios	
APGAR score, $\text{Mean}\pm\text{SD (median)}$	8.26 \pm 0.83 (8)	7.56 \pm 1.03 (7)	¹ 0.008**
Mode of delivery, n (%)			
Normal	71 (%73.2)	7 (%43.8)	² 0.037*
Cesarean section	26 (%26.8)	9 (%56.3)	
NICU admission, n (%)			
Non-required	88 (%90.7)	11 (%68.8)	² 0.028*
Required	9 (%9.3)	5 (%31.3)	

¹Mann Whitney U Test, ²Fisher's Exact Test, * $p<0.05$, ** $p<0.01$

DISCUSSION

Expectant management of post-term pregnancies is a controversial issue in obstetric practice due to increased maternal and neonatal risks. Studies have shown that performing labor induction at 41 weeks of gestation yields better perinatal outcomes. Kaimal et al. (4) investigated cost-effectiveness of labor induction at 41 weeks in nulliparous women and found that there was no significant difference in cesarean delivery

rate and parity, whereas neonatal demise, shoulder dystocia, meconium aspiration syndrome, and severe perineal lacerations were significantly lower (4). Gulmezoglu et al. (5) published a Cochrane Review in 2012, in which they evaluated 22 studies and a total of 9.383 pregnant women. The authors found that perinatal mortality, meconium aspiration, cesarean delivery rate, and parity were significantly lower in the women that underwent induction of labor at 41 weeks as compared to women that underwent induction of labor at 42 weeks.

Although labor induction success is hard to determine, there are numerous factors affecting the probability of vaginal delivery following induction of labor. These factors include parity, Bishop score, advanced maternal age, gestational age, maternal body mass index, and maternal weight gain during pregnancy (3-5).

Parity is a powerful predictor of labor induction success. Previous studies have shown that the rate of induced vaginal delivery is significantly higher in multiparous women compared to nulliparous women (4-7). In addition, some other studies have reported that no significant difference was found between the patients delivered by vaginal delivery and cesarean section (8,9). In our study, the rate of induced vaginal delivery was significantly higher in multiparous women compared to nulliparous women ($p=0.019$; $p<0.05$). However, parity established no significant correlation with Apgar score and admission to NICU ($p>0.05$, $p>0.05$).

Bishop score is another useful predictor of labor induction success. Cervical examination is of prime importance for elective labor induction (4-6). The primary aim in this method is to predict whether labor will commence spontaneously. Moreover, this method also enables gynecologists to evaluate the success of elective labor induction. In addition to Bishop score, there are some other modalities used for predicting preterm birth, such as ultrasonographic assessment of cervical length and fetal fibronectin testing. Although these two methods have been shown to yield more objective outcomes compared to Bishop score, superiority of these methods over each other or over Bishop score remains controversial (6,7).

Previous studies indicate that the pregnant women with favorable Bishop scores have low cesarean sec-

tion rates. In addition, these patients have been shown to have high rates of successful labor induction; however, an unfavorable Bishop score does not suggest that vaginal delivery is not likely. Teixeira et al. (7) conducted a meta-analysis and suggested that there is a strong relationship between favorable Bishop scores and successful labor induction and that Bishop score is the most accurate and cost-effective method in the prediction of the success of vaginal delivery and labor induction. In our study, in line with the literature, the rate of induced vaginal delivery was significantly higher in patients with Bishop score ≥ 7 than in patients with Bishop score < 7 ($p=0.003$; $p<0.01$). Moreover, a significant correlation was found between Bishop score and Apgar score ($p<0.05$), and admission to NICU was significantly higher in patients with Bishop score < 7 than in patients with Bishop score ≥ 7 ($p=0.019$; $p<0.05$).

Literature reviews indicate that the studies reporting on the relationship between amniotic fluid index (AFI) and labor induction success are limited. In the present study, we found a correlation between AFI and labor induction success. We also found that the rate of induced vaginal delivery was significantly higher in patients with normal AFI than in patients with oligohydramnios ($p=0.037$; $p<0.05$). In addition, Apgar score was significantly higher in the infants of the patients with normal AFI compared to patients with oligohydramnios ($p=0.008$; $p<0.01$) and the rate of NICU admission was higher in patients with oligohydramnios than in patients with normal AFI ($p=0.028$; $p<0.05$). We also evaluated the patients in terms of both Bishop score and AFI and we analyzed the effects of these parameters on labor induction success. The analysis indicated that parity and the rate of cesarean delivery followed by labor induction were significantly higher in patients with an unfavorable Bishop score and oligohydramnios. Nevertheless, further prospective, controlled, randomized studies are required to clarify the association between AFI and labor induction success.

The present study, despite having a retrospective research design, provides a valuable contribution to the literature since it reports on the association between amniotic fluid index and labor induction success and

it also emphasizes the relationship between Bishop score, parity and labor induction, Apgar score, and neonatal intensive care unit admission. We conclude that performing labor induction at 41 weeks of gestation is a better option since it is a cost-effective method and provides better neonatal and maternal outcomes. Moreover, Bishop score, parity, and amniotic fluid index indicate labor induction success as well as Apgar score and neonatal intensive care unit admission.

Conflict of Interest

The authors have no conflict of interests

REFERENCES

1. Martin JA, Hamilton BE, Sutton PD, Ventura SJ, Mathews TJ, Kirmeyer S, Osterman MJ. Births: final data for 2007. *Natl Vital Stat Rep* 2010;58(24):1-85.
2. Sanchez-Ramos L, Olivier F, Delke I, Kaunitz AM. Labor induction versus expectant management for postterm pregnancies: a systematic review with meta-analysis. *Obstet Gynecol* 2003;101(6):1312-8. <https://doi.org/10.1097/00006250-200306000-00029>
3. Heuser C, Manuck T, Hossain S, Silver R, Varner M. Non-anomalous stillbirth by gestational age: trends differ based on method of epidemiologic calculation. *J Matern Fetal Neonatal Med* 2010;23(7):720-4. <https://doi.org/10.3109/14767050903387086>
4. Kaimal AJ, Little SE, Odibo AO, et al. Cost-effectiveness of elective induction of labor at 41 weeks in nulliparous women. *Am J Obstet Gynecol* 2011;204(2):137.e1-9. <https://doi.org/10.1016/j.ajog.2010.08.012>
5. Gülmezoglu AM, Crowther CA, Middleton P, Heatley E. Induction of labour for improving birth outcomes for women at or beyond term. *Epub 2010 Oct 20 Cochrane Database Syst Rev* 2012;(6):CD004945.
6. Uyar Y, Erbay G, Demir BC, Baytur Y. Comparison of the Bishop score, body mass index and transvaginal cervical length in predicting the success of labor induction. *Arch Gynecol Obstet* 2009;280(3):357-62. <https://doi.org/10.1007/s00404-008-0915-x>
7. Teixeira C, Lunet N, Rodrigues T, Barros H. The Bishop Score as a determinant of labour induction success: a systematic review and meta-analysis. *Arch Gynecol Obstet* 2012;286(3):739-53. <https://doi.org/10.1007/s00404-012-2341-3>
8. Gelisen O, Caliskan E, Dilbaz S, et al. Induction of labor with three different techniques at 41 weeks of gestation or spontaneous follow-up until 42 weeks in women with definitely unfavorable cervical scores. *Eur J Obstet Gynecol Reprod Biol* 2005;120(2):164-9. <https://doi.org/10.1016/j.ejogrb.2004.08.013>
9. Osmundson S, Ou-Yang RJ, Grobman WA. Elective induction compared with expectant management in nulliparous women with an unfavorable cervix. *Obstet Gynecol* 2011;117(3):583-7. <https://doi.org/10.1097/AOG.0b013e31820caf12>