



Labor induction and the risk of cesarean delivery among term pregnancies

Farnazeh Zandvakili¹, Roonak Shahoei^{2*}, Daem Roshani³ and Lila Hashemi Nasab⁴

¹Assistant professor, Medical school of Kurdistan University of Medical sciences, Sanandaj, Iran

²Associated Professor, Nursing & Midwifery School of Kurdistan University of Medical Sciences, Sanandaj, Iran

³Assistant Professor of Biostatistics, Department of Epidemiology & Biostatistics, School of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran

⁴Lecturer, Nursing & Midwifery School of Kurdistan University of Medical Sciences, Sanandaj, Iran

Corresponding Email: rshaho@yahoo.com

ABSTRACT

Labor induction is one of the most common obstetric interventions. The aim of this study was to determine the relationship between induction and risk of cesarean section delivery for women with term pregnancies who were admitted to Bessat hospital in Sanandaj from 2012 to 2013. This study was a prospective cohort study in which study population were pregnant women who were admitted to Bessat hospital in Sanandaj (Kurdistan province in North Western Iran) from 2012 to 2013. Study samples size were 539 cases using convenience sampling among eligible pregnant women admitted to Bessat Hospital for induction. Results of the study showed that a total of 539 women underwent induction. Mean age of the study units were 26.7 ± 5.6 years. In terms of education, 63.3 % were at the elementary level, the majorities (94.6%) were housewives, and 57.4% were nulliparous. The mean gestational age was 39.3 ± 2.6 weeks (Table 1) and post-term pregnancies (40.63%), PROM (24.12%) and non-reactive NST (7.79%) were among the most common causes for induction. Dilatation and birth weight could be factors predicting labor induction success. Furthermore, performing Induction in dilatation 3 cm or less could be associated with an increased risk of cesarean delivery.

Keywords: Cesarean section, elective induction, labor, parous

INTRODUCTION

Labor induction is one of the most common obstetric interventions [1]. According to most current studies, the rate varies from 9-33% of all pregnancies annually [2]. According to ACOG [American Congress of Obstetricians and Gynecologists], one fifth of all pregnancies are terminated with induction method [3]. The aim of induction is preventing the maternal and fetal disorders such as preeclampsia, premature rupture of membranes, intrauterine growth retardation and prolonged pregnancy [4]. But it is performed in some cases such as mother's request [1] physician recommendation or fear of legal problems [5].

Since the purpose of induction is vaginal delivery, a number of authors consider successful induction as vaginal delivery without regarding to the time limits [8-6]. But others considered time as an outcome and successful induction as vaginal delivery in specific time interval [9, 10]. Induction failure is defined as failure of induction leading to cesarean section [12, 11].

Although induction is a method of treatment, however it is a medical intervention and thus might lead to undesirable effects such as increased rates of cesarean delivery, postpartum hemorrhage, fetal distress [4], ineffective prolonged labor [13], increased instrumental vaginal delivery, neonatal jaundice, and immediate care of the newborn [14].

Compared with spontaneous labor, it increases medical care cost, this could be due to a longer stay in hospital and admission to the intensive care unit in mothers and babies who are undergoing cesarean section [14, 15].

Induction success is directly depending on cervix status and rate of cesarean is higher in women with an unfavorable cervix [16]. Vrouenraets and colleagues [2005] examined 1389 women for Bishop Score and risk of cesarean delivery after induction in nulliparous women. The cesarean delivery rate was 12.0% in women with a spontaneous onset of labor, 23.4% in women undergoing labor induction for medical reasons, and 23.8% in women whose labor were induced electively. The results of the study showed that a Bishop score of 5 or less was a predominant risk factor for a cesarean delivery in all 3 groups. Researchers reported that in Nulliparous women with a singleton pregnancy and cephalic presentation undergoing elective induction or induction for medical reasons risk of cesarean section is greater and it may be associated with an unfavorable Bishop score compared with the group who had spontaneous labor [14]. In addition to unfavorable cervix other factors that increase the risk of cesarean section after induction include: being nulliparous, obesity, maternal age greater than 30 years, fetal macrosomia, use of epidural anesthesia, use of magnesium sulfate, and Chorioamnionitis [16]. The aim of this study was to determine the relationship between induction and risk of cesarean section delivery for women with term pregnancies who were admitted to Bessat hospital in Sanandaj from 2012 to 2013.

MATERIALS AND METHODS

This study was a prospective cohort study in which study population were pregnant women who were admitted to Bessat hospital in Sanandaj (Kurdistan province in North Western Iran) in 2012-2013. Study samples size were 539 cases using convenience sampling among eligible pregnant women admitted in Bessat Hospital for induction. Inclusion criteria include: singleton pregnancy, cephalic presentation, gestational age > 37 weeks, and having evidence supporting indications for induction. After admission to the labor ward the conditions reviewed by one of the midwifery trainers (research assistant), and after approving the inclusion criteria selected women were enrolled in the study.

Data collected via researcher made questionnaire which included questions on demographic characteristics including (age, education, and occupation), Obstetric history (number of pregnancies or gravida, parity, and gestational age), Information about induction (start of induction, rate of dilation, effacement, descent, position and consistency of the cervix, Bishop score, membranes, method of induction, and induction frequency), as well as questions about outcome of the induction, method of delivery (vaginal, instrumental, caesarean section), infant weight, and Apgar scores in the first and fifth minutes after birth. Questionnaire validity was confirmed by content validity and its reliability was evaluated by test-retest method. Informed consents were taken and questionnaires were completed in the time of data collection. Before the induction, vaginal examination was performed by a research assistant and Bishop Score and cervical condition were recorded in the questionnaire. Then the process of induction during labor and in the time of delivery was controlled and recorded. After delivery, delivery information including (vaginal, instrumental, cesarean section) was recorded in the questionnaire. In this study successful induction was defined as vaginal birth. Data analysis was performed using SPSS version 20. Chi-square and t-test were used to compare groups with significant levels of less than 0.05, and logistic regression test was used to determine odds ratio with 95% confidence level.

RESULTS

Results of the study showed that a total of 539 women underwent induction. Mean age of the study units were 26.7 ± 5.6 years. In terms of education, 63.3 % were at the elementary level, the majorities (94.6%) were housewives, and 57.4% were nulliparous. The mean gestational age was 39.3 ± 2.6 weeks (Table 1) and post-term pregnancies (40.63%), PROM (24.12%) and non-reactive NST (7.79%) were among the most common causes for induction. Other causes are listed in table 2.

Specifications	Number (%)
Age	
≤19	46(5.8)
20-24	157 (29.2)
25-29	169 (31.3)
30-34	105 (19.5)
≥35	11.5 (62)
Education	
Illiterate	29 (5.4)
Primary	341 (63.3)
Secondary	144 (26.7)
University	25 (4.6)
Occupation	
Home Attendant	510 (94.6)
Employed	29 (5.4)
Parity	
Primiparours	308 (57.14)
Multiparous	231 (42.86)
Mode of delivery	
Vaginal	157 (29.1)
Vaginal + Episiotomy	251 (46.5)
Vacuum or forceps	12 (2.3)
Caesarean section	119 (22.1)
Induction Method	
Oxytocin	338 (72)
Prostaglandin E2	14(6.2)
Amniotomy + oxytocin prostaglandins + Oxytocin	93 (17.3)

No (%)	Cause
219(40.63)	Post term
130 (24.12)	PROM
29 (5.38)	Failure of progress
41(7.61)	Hypertension disorder
42(7.79)	NST (Non Reactive)
29 (5.38)	Maternal disease
11(2.04)	Fetal disorder (IUFD, IUGR, Abnormally)
20 (3.71)	Oligohydramnios
18 (3.34)	physician order

Etiology	No (%)
Failure of progress	57(47.90)
Fetal distress	27(22.69)
Meconium	23(19.33)
Other (Placental abruption, CPD, Macrosomia)	12(10.08)
Failure of progress	57(47.90)
Fetal distress	27(22.69)
Total	119 (100)

Table 4: Success rate of induction in subjects according to infant's birth weight

Birth Weight	≤2500	2500-4000	≥4000
Induction Success			
Yes	17 (70.8)	371 (76.7)	24 (77.4)
No	7(29.2)	113 (23.3)	7 (22.6)
Total No.	24(4.5)	484 (8.89)	31 (5.8)

To perform induction oxytocin alone in 72% of the cases, misoprostol alone in 2.6 % of the cases as well as combination regimes in 85.6% of the cases were used leading to vaginal delivery (Table 1). Most common cause for caesarean section was failure of progress (47.90%), Other causes are listed in Table 4. The mean birth weight of babies was 3403 ± 475 g. The mean Apgar score for minute one and minute five were 8.8 ± 0.56 and 8.9 ± 0.65 respectively.

There was no significant relationship between maternal age ($P=0.724$) and Parity ($p=0.286$) with success rate of induction, whereas a significant relationship between number of pregnancies with success rate of induction ($p=0.002$) was found. In addition, there was no significant correlation between Bishop Score and induction success ($p=0.286$) and no statistically significant difference between the induction successes with dilatation ($p=0.000$). There was a significant relationship between the method of induction and its success ($p=0.000$) nevertheless, no significant correlation was found between delivery success and induction regimen (high or low dose) ($p=0.038$). From the other side, there was a statistically significant relationship between success of induction and birth weight ($p = 0.03$) (Table 4).

Effect of variables including; dilation, effacement, descent, cervical position, cervical consistency, maternal age, and parity on the success of induction using logistic regression models was controlled and the results showed that among all of the above variables, just effect of dilatation on the success of induction was significant ($P=0.03$). Other variables were not significant in the logistic regression model and were removed. Logistic regression results indicated that success of induction in 4 cm dilatation is 1.24 times compared to 1 cm dilatation and chances of successful induction increased with increasing dilatation. Logistic regression showed that chances of cesarean section for those with cervical dilatation of 3 cm or less was 2.5 times higher than those who with 4 cm or higher dilation (OR=2.5, 95% CI, 0.87-7.2).

DISCUSSION

Induction success rate in this study was 87.9% which is in agreement with the results of other studies (7, 17, and 19). Induction success rate in Al shaikh et al study had been reported as (84%). This difference could be due to type of induction. We used oxytocin for the majority of patients in our study since it is a routine medication in our center, whereas; prostaglandin E2 were used for 86.7% of the cases in Al Shaikh et al study (17).

Oxytocin is used as a preferred method for induction of labor in Latin America (19). More use of oxytocin in our center is because of its availability which is not associated with cervical status. In the present study, number of women for whom more than one method of induction was used was about 25.5%. Nevertheless, higher percentage of oxytocin alone usage (72%) could imply the acceptance and availability of oxytocin in our medical center.

In this study, the most common indication for induction was post-term pregnancy which was in consistent with other studies (4, 12, 17, 20, 21). Induction in post-term pregnancy compared to prenatal survival rate and expectant treatment may be associated with a decrease in prenatal mortality rate (22).

Although many researchers believe that increasing the number of deliveries will be followed by favorable outcome of induction, the failure rate of induction in nulliparous women was 29.1% and for multipara women it was 64.01% that is consistent with Rayamajhi et al study (18). This difference could be the result of decisions made by specialists in our center and multipara women who prefer cesarean for fear of induction complications. Since in this study duration of latent and active phase of labor were not recorded; therefore, there is no information about the impact of duration of these phases on physician's decision. The results of this study showed significant association between birth weight and successful induction, which is in agreement with the results of Vrouenrates et al study. Hence, induction failure rate increased with increasing birth weight (14).

Although the results of the present study showed no significant relationship between Bishop Score and induction success, and regression model showed a significant correlation between dilatation and successful induction. Sadeghi et al in a study aimed to determine factors predicting successful labor induction showed that every one centimeter dilation increase the likelihood of successful labor induction about 2.55 times and reported that dilation could be a factor in predicting successful induction (20). Results of the present study showed that by increasing one cm of dilation the chance of a successful induction will be 0.31 times. Other components of Bishop (effacement, descent, cervical consistency, and cervical position) had no effect on the prediction of a successful induction. In our medical center Bishop score is determined only by finger examining, while Eggebo et al believe that despite the widespread use of Bishop score this method lacks the power to predict success of induction and recommended that it is better to replace it by another method such as cervical assessment by sonography that is a better predictor for the outcome of induction (9).

Results of this study showed that chance of cesarean section for those who had cervical dilatation of 3 cm or less was 2.5 times higher than those who had dilation of 4 cm or high (95% CI, 0.87-7.2). This finding is in consistent

with results of Jacquemyn et al and Ehrenthal et al studies (23, 24). In addition, findings are somewhat similar to Vahratian et al results that reported nulliparous women who had an elective induction with cervical ripening had 3.5 times the risk of cesarean delivery during the first stage of labor compared with those admitted in spontaneous labor, but elective induction without cervical ripening, on the other hand, was associated with a faster labor progression from 4 to 10 cm and did not increase the risk of cesarean delivery, compared with those in spontaneous labor (11). The current study also showed there was no significant relationship between Bishop Score and induction success rate, but dilatation is of higher predictive value and in lower dilatation the risk of cesarean delivery is higher in induction.

The results of this study also is consistent with the results of Heffner et al who reported that In nulliparas, labor induction was associated with an increase in cesarean delivery from 13.7% to 24.7% (adjusted odds ratio [OR] 1.70; 95% confidence interval [CI] 1.48, 1.95]. In multiparas, induction was associated with an increase from 2.4% to 4.5% (OR 1.49; 95% CI 1.10, 2.00). Other variables that placed a nulliparous woman at increased risk for cesarean delivery included maternal age of at least 35 years and gestational age of over 40 weeks. For multiparas, only maternal age 40 years or older and gestational age of 41 weeks were associated with an increase in cesarean deliveries (25). Although in the present study both nulliparous and multipara group who underwent induction were not investigated separately, but between age and success of induction (vaginal delivery) did not show a significant statistical relationship.

The strengths of this study are; being prospective, investigating nulliparous and multiparous women who are undergoing induction for medical reasons, providing information regarding the confirmation of Bishop score in predicting successful induction, providing information on the outcome of induction as one of the most common obstetric interventions as well as, data collected by trained midwives. Weaknesses of this study could be lack of data on Latent and Active phase during the first stage and second stage of labor, groups were not separated into nulliparous and multiparous women, nulliparous and multiparous groups were not compared, and they were not compared with women in spontaneous labor. Also the complications of this procedure have not been studied and cervical check has been done only by finger examining. Because this study was conducted only at one center, it has a low power and cannot be generalized effectively. Therefore further studies should be conducted to determine the induction period and decision time for intervention in nulliparous and multiparous women.

CONCLUSION

Dilatation and birth weight could be factors predicting labor induction success. Furthermore, performing Induction in dilatation 3 cm or less could be associated with an increased risk of cesarean delivery.

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