

# Spontaneous versus Induced Labor Delivery, a Retrospective Analysis

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## Abstract

**Background:** Induction of labor is the stimulation of the uterus to initiate the labor process whether by administering oxytocin, prostaglandin or rupturing the membrane [1]. It was realized that the number of induction of labor patients was thought to be increasing in comparison with the spontaneous labor patients. Therefore, the complications of induced labor were higher. A detailed analysis was needed to confirm that. **Objective:** The aim of the study is to analyze the outcomes between spontaneous versus induced labor. **Materials and Methods:** A retrospective analysis was conducted at our tertiary care university hospital, in the period from December 2015 to December 2016 when 311 women were divided into two groups: group 1, women who had spontaneous labor (n = 106) compared with group 2, women who were labor induced (n = 205). Complications of pregnancy, delivery type, tear, episiotomy, blood transfusion and instruments used were analyzed retrospectively. **Results:** The mean  $\pm$  SD of baseline characteristics, like age, height, weight, BMI and hemoglobin level for all study samples was  $28.59 \pm 5.95$  years,  $1.58 \pm 0.06$  m,  $71.77 \pm 13.42$  kg,  $28.59 \pm 5.89$  kg/m<sup>2</sup> and  $11.08 \pm 1.45$  g/dl respectively. A statistically significant difference was noticed in the duration of labor between spontaneous and induced labor (95% CI: 9.194 - 152.130; p-value 0.004 and OR: 0.239). There was no significant difference in complications, delivery type (Spontaneous Vaginal Delivery (SVD) or other), blood transfusion, and instrument used between women who had spontaneous labor versus induced labor. However, significant differences in tear (95% CI: 4.354 - 0.996; p-value 0.035) and episiotomy (95% CI: 0.928 - 0.224; p-value 0.028) were found between the two groups. In conclusion, the induced labor was found to be associated with high incidence of duration of labor, tear and episiotomy. Patients should always be counseled when there it is an option between the two delivery types.

## Keywords

Cesarean Section, Labor Induction, Spontaneous Labor, Spontaneous Vaginal

## 1. Introduction

Induction of labor is the stimulation of the uterus to initiate the labor process whether by administering oxytocin, prostaglandin or rupturing the membrane [1]. It has become a common procedure with an increase interest in the medical aspect of research and an increasing prevalence rate in most developed countries from 9.5% (1990) to 23.4% (2010) in the United States of America [2] [3].

The study that was performed by King Khalid University Hospital, Riyadh Saudi Arabia from the period of April 2010 to March 2011 concluded an increase in the prevalence of induction of labor by 16%. Primarily due to post-term pregnancy and diabetes mellitus [4], there was a deficiency of research conducted in Saudi Arabia on this subject.

Labor induction proposes a risk to the mother and/or the baby; some of these risks include fetal distress, instrumental delivery, cesarean delivery, neonatal intensive care unit admission, and epidural analgesia [1] [5] [6].

It was realized that the number of induction of labor patients was increasing in comparison with the spontaneous labor patients. Therefore, the complications of induced labor were higher. A detailed analysis was needed to confirm that.

## 2. Materials and Methods

A retrospective analysis was conducted at our tertiary care university hospital, in the period from December 2015 to December 2016, when we recruited 311 women who approached the Labor and Delivery and were divided into two groups, 38 patients, went for induced labor and the other group (n = 205) had spontaneous labor. Complications of pregnancy, delivery type, tear, episiotomy, blood transfusion and instruments used were analyzed retrospectively. All data had been collected electronically from our patient's medical electronic files within the university hospital.

The aim of the study was to analyze the outcomes between spontaneous versus induced labor. The distribution of characteristics is shown in table [1].

Women with spontaneous active labor pain on admission were assigned to the spontaneous group. Active labor pain was defined as regular, painful uterine contractions with progressive cervical dilatation. Oxytocin was used to augment inadequate uterine contractions. Continuous electronic fetal monitoring was used for all patients. Epidural analgesia (if elected) was provided as a continuous infusion of ropivacaine plus fentanyl.

In women who were subjected to labor induction, labor was induced using a vaginal prostaglandin E<sub>2</sub> suppository (10 mg of dinoprostone) or oxytocin, either independently or in sequence. Cervical ripening status was given a Bishop score

on admission. At a score of 4 or less, a vaginal prostaglandin E<sub>2</sub> suppository was inserted for cervical ripening and maintained for up to 10 hours, unless rupture of the membranes, signs of fetal distress, or regular contractions necessitated earlier withdrawal.

### Statistical Analysis

Descriptive statistics were used to see the means of categorical variables for all women, women experienced spontaneous labor, and those who had induced labor. Continuous variables were presented as mean  $\pm$  SD. Independent samples t-test was done to compare the means of continuous variables for spontaneous versus induced labor. Complications of pregnancy, delivery type, tear, episiotomy, blood transfusion and instrument used for delivery were compared between women who had spontaneous labor versus induced labor by Chi-Squared test.

All analyses were performed in 95% confidence interval using Statistical Package for Social Science (SPSS), version 20 (IBM, Armonk, NY, USA).

### 3. Results

Total 311 women who were undergoing labor included in this retrospective chart review study according to the inclusion criteria. The mean  $\pm$  SD of baseline characteristics like - age, height, weight, BMI and hemoglobin level for all study samples were  $29.03 \pm 5.95$  years,  $1.58 \pm 0.06$  m,  $71.77 \pm 13.42$  kg,  $28.59 \pm 5.89$  kg/m<sup>2</sup> and  $11.08 \pm 1.45$  g/dl respectively. Baseline characteristics of women had spontaneous labor and induced labor was presented in **Table 1**. There was no significant difference in baseline characteristics except the weight of the mother (CI: 3.104 - 5.675; p-value 0.021) (**Table 2**).

The percentage of induced labor was reported higher for nulligravida women (55.3%) while spontaneous labor was more common in multigravida women (52.7%). Similarly, most of the nulliparous women had induced labor (55.3%) whereas most of the multiparous women had spontaneous labor (54.6%). Pregnancy complications like Diabetes Mellitus (DM), Hypertension (HTN), Premature Rupture of Membrane (PROM), Preeclampsia Toxemia (PET), Meconium Stained Liquor (MSL), Gestational Diabetes Mellitus (GDM) etc were more prevalent among women who had induced labor (57.9%) in comparison with women had spontaneous labor (42.4%). One percent mother had forceps delivery and 3% had ventouse delivery during spontaneous labor but none of the study participants had forceps delivery during induced labor and only 1 (2.6%) women needed ventouse during induced labor (**Table 3**). The “tear” was more reported in spontaneous labor than induced labor (48.3% vs 31.6%) while episiotomy was more reported in induced labor than spontaneous labor (44.7% vs 26.8%). Only 2 (0.6%) women required the blood transfusion. The mean  $\pm$  SD blood loss and baby weight for all respondents were  $365.45 \pm 274.50$  ml and  $3.01 \pm 0.063$  kg respectively (**Table 1**).

**Table 1.** Distribution of characteristics in all respondents (n = 311), mothers with spontaneous labor (n = 205) and mothers with induced labor (n = 38).

Variables	All mothers (n = 311)	Spontaneous labor (n = 205)	Induced labor (n = 38)
<b>Age in years; Mean (<math>\pm</math>SD)</b>	29.03 ( $\pm$ 5.95)	28.34 ( $\pm$ 5.69)	27.87 ( $\pm$ 5.33)
<b>Height in meters; Mean (<math>\pm</math>SD)</b>	1.58 ( $\pm$ 0.06)	1.59 ( $\pm$ 0.06)	1.58 ( $\pm$ 0.05)
<b>Weight in kg; Mean (<math>\pm</math>SD)</b>	71.77 ( $\pm$ 13.42)	70.82 ( $\pm$ 13.14)	72.11 ( $\pm$ 9.22)
<b>BMI in kg/m<sup>2</sup>; Mean (<math>\pm</math>SD)</b>	28.59 ( $\pm$ 5.89)	28.20 ( $\pm$ 5.18)	28.28 ( $\pm$ 5.88)
<b>Gravida n (%)</b>			
Nulligravida	79 (25.4)	48 (23.4)	21 (55.3)
Primigravida	66 (21.2)	49 (23.9)	4 (10.5)
Multigravida	165 (53.1)	108 (52.7)	13 (34.2)
Missing	1 (0.3)	0 (0)	0 (0)
<b>Para n (%)</b>			
Nullipara	78 (25.1)	47 (22.9)	21 (55.3)
Primipara	60 (19.3)	45 (22.0)	4 (10.5)
Multipara	171 (55.0)	112 (54.6)	13 (34.2)
Missing	2 (0.6)	1 (0.5)	0 (0)
<b>Hemoglobin in g/dl; Mean (<math>\pm</math>SD)</b>	11.08 ( $\pm$ 1.45)	10.99 ( $\pm$ 1.49)	11.44 ( $\pm$ 1.41)
<b>Complications n (%)</b>			
Yes	172 (55.3)	87 (42.4)	22 (57.9)
No	107 (34.4)	89 (43.4)	14 (36.8)
Missing	32 (10.3)	29 (14.1)	2 (5.3)
<b>Gravitational age in days; Mean (<math>\pm</math>SD)</b>	268.51 ( $\pm$ 20.19)	270.07 ( $\pm$ 19.98)	271.63 ( $\pm$ 14.69)
<b>Delivery n (%)</b>			
SVD	203 (65.3)	169 (82.4)	32 (84.2)
Other	108 (34.7)	36 (17.6)	6 (15.8)
<b>Duration of labor in minutes; Mean (<math>\pm</math>SD)</b>	385.40 ( $\pm$ 226.68)	409.39 ( $\pm$ 187.56)	490.05 ( $\pm$ 270.86)
<b>Instruments used</b>			
Forceps	2 (0.6)	2 (1.0)	0 (0)
Ventouse	9 (2.9)	7 (3.4)	1 (2.6)
No instrument used	300 (96.5)	196 (95.6)	37 (97.4)
<b>Tear n (%)</b>			
Yes	113 (36.3)	99 (48.3)	12 (31.6)
No	195 (62.7)	103 (50.2)	26 (68.4)
Missing	3 (0.9)	3 (1.2)	0 (0)
<b>Episiotomy n (%)</b>			
Yes	73 (23.5)	55 (26.8)	17 (44.7)
No	237 (76.2)	149 (72.7)	21 (55.3)
Missing	1 (0.3)	1 (0.5)	0 (0)
<b>Blood transfusion n (%)</b>			
Yes	2 (0.6)	1 (0.5)	1 (2.6)
No	308 (99.0)	203 (99.0)	37 (97.4)
Missing	1 (0.3)	1 (0.5)	0 (0)
<b>Blood loss in ml; Mean (<math>\pm</math>SD)</b>	365.45 ( $\pm$ 274.50)	268.09 ( $\pm$ 211.71)	313.16 ( $\pm$ 224.72)
<b>Baby weight in kg; Mean (<math>\pm</math>SD)</b>	3.01 ( $\pm$ 0.63)	3.05 ( $\pm$ 0.59)	3.01 (0.55)

\*Type of labor was not recorded for 68 mothers.

**Table 2.** Independent samples t-test to compare the means of continuous variables for the women undergone spontaneous versus induced labor.

Variables (unit)	Mean difference (Spontaneous-induced)	Standard error	95% Confidence interval	p-value
Age (Years)	0.468	0.995	2.429 - 1.493	0.531
Height (m)	0.003	0.010	0.022 - 0.017	0.407
Weight (kg)	-1.286	2.228	3.104 - 5.675	0.021
BMI (kg/m <sup>2</sup> )	-0.080	0.934	1.761 - 1.921	0.368
Hemoglobin level (g/dl)	-0.445	0.261	0.069 - 0.960	0.473
Gravitational age (days)	-1.562	3.405	5.145 - 8.269	0.399
Duration of labor (min)	-88.662	36.275	0.089 - 0.639	0.004
Blood loss (ml)	-45.067	37.852	29.505 - 119.640	0.199
Baby weight (kg)	0.038	0.104	0.242 - 0.166	0.087

**Table 3.** Differences in pregnancy complications, type of delivery, tear, episiotomy, blood transfusion and instrument use for women undergone spontaneous versus induced labor.

Variables	Odds ratio	Relative risk	95% Confidence interval	p-value
Complications	0.622	0.924	1.294 - 0.299	0.137
Delivery type	0.880	0.981	2.261 - 0.343	0.502
Tear	2.083	1.117	4.354 - 0.996	0.035
Episiotomy	0.456	0.872	0.928 - 0.224	0.028
Blood transfusion	0.182	0.591	2.366 - 0.148	0.686
Instrument used	-	1.143	1.485 - 0.880	0.800

A statistically significant difference was noticed in the duration of labor between spontaneous and induced labor (95% CI: 9.194 - 152.130; p-value 0.004 and OR: 0.239). There was no significant difference in complications, delivery type (SVD or other), blood transfusion and instrument used between women had spontaneous labor versus induced labor. But, significant differences in tear (95% CI: 4.354 - 0.996; p-value 0.035) and episiotomy (95% CI: 0.928 - 0.224; p-value 0.028) were found between spontaneous and induced labor.

#### 4. Discussion

This study was conducted to analyze the outcome between spontaneous and induced labor. In terms of limitations, this study was retrospective in design, thus selection of patients was not biased and all patients were included at the specified period. Charts were individually reviewed by one investigator and confirmed with the database system for reassurance of accurate classification.

Women who had induction of labor were found to have an increased risk of adverse outcomes, induced labor was found to be associated with high incidence of duration of labor, tear and episiotomy.

We found out that elective induction of labor was associated with a higher need for anesthesia that interferes with the normal development of delivery even

if there were no maternal complications.

Our study have included all patients visited our department for delivery where some other studies such as Sood P. *et al.*, [2], their study was limited to multiparous women, and they did not address patient management with PROM.

Looking at Al-Shaikh GK *et al.* [4] they maintained that parity, hypertension, diabetes, older maternal age, and higher birth weight influence the rate of CS, but not the induction of labor. Others Cammu H. *et al.*, [5] they have studied outcome after elective induction in nulliparous women only.

More studies are going to be conducted in our university hospital studying in more details the reasons behind the increased number of women for induction of labor and their relation with the parity, then discussing the relation between the increase number of induced labor with the effect on the progression of labor and the incidence and risk of Cesarean section.

## 5. Conclusion

The induced labor was found to be associated with high incidence of duration of labor, tear and episiotomy. Patients should always be counseled when there is an option between the two delivery types.

## Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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