

Elective Induction versus Spontaneous Labor at Term: A Prospective Study of Outcome and Complications

Tanmay Mathur¹, R.K. Deora², Saroj Chaudhary³, Indra Bhati⁴, Divya Mittal⁵

Abstract: ***Background:** This study aims at identifying the association between inductions of labor to caesarean delivery and other associated maternal and neonatal outcomes. **Methods:** The study subjects were divided into two groups, elective induction group and spontaneous labor group. They were matched for maternal age, parity and gestational age. Duration of first and second stage of labor, mode of delivery, if caesarean section, indication for caesarean section, maternal age, birth weight was analyzed. Maternal intrapartum and post-partum complications and fetal outcome were also analyzed. **Results:** Out of the 400 women in the study, 200 were induced and 200 were those who went into spontaneous labor. The rate of cesarean section rate among induced group is 35.5% and was statistically significant. There was significant decrease in the duration of second stage of labor in the induced primipara group with p value of 0.036. There was no significant difference in the maternal and neonatal complications. **Conclusions:** This study concludes that elective induction pose an increased risk of cesarean section. Elective induction does not cause any increased risk to mother and fetus.*

Keywords: Foetal outcome caesarean delivery, Induction of labour, Maternal outcome

1. Introduction

The ultimate outcome of good Obstetric care is the delivery of a healthy baby with a healthy mother. A fact that sounds so simple is actually a coveted aim achieved only after meticulous planning of antenatal care and delivery. There are times when the benefits of delivery outweigh the continuation of pregnancy and the need for "induction of labour" arises.

Induction of labor is among the most common obstetric interventions being done now. *More than 22% of all gravid women undergo induction of labor in the United States, and the overall rate of induction of labor in the United States has more than doubled since 1990 to 225 per 1,000 live births in 2006.*(1) *The goal of induction of labor is to achieve vaginal delivery by stimulating uterine contractions before the spontaneous onset of labor.* Rate of induction in India being reported as 32.1% (Chawla et al, 2017).

Elective induction of labor means initiation of labor at term pregnancy. It may be motivated by a variety of reasons and has been utilized since decades. Since elective induction of labor has neither indication nor benefit from a strict medical point of view, it should not increase adverse outcomes when compared to spontaneous labor. But inducing labor may also pose risks such as uterine hyper stimulation, infection, rupture uterus, cord prolapse, iatrogenic prematurity and failed induction resolved by caesarean delivery. There is a critical uncertainty about the effect of elective induction of labor on the rate of caesarean delivery. Thus, determining the effect of elective induction of labor on caesarean delivery as well as other maternal and neonatal outcomes is important.

This study aims at identifying the association between induction of labor in primigravida and multigravida to caesarean delivery and other associated maternal and neonatal outcomes. And to observe whether electively induced labor will pose the mother and fetus at an increased risk as compared with her spontaneous labor cohort.

The main objective of this study is to determine the influence of induction of labor on caesarean delivery. Other objectives being, to determine and compare the maternal outcomes like prolongation in duration of labor, uterine hyperstimulation, mode of delivery and delivery complications like atonic post-partum hemorrhage, traumatic post-partum haemorrhage and still birth, in induced labor group with their counterparts. This study also compares neonatal outcomes like NICU admissions for meconium aspiration, hyperbilirubinemia, respiratory distress in induced labor group with their counterparts.

2. Methods

This is a prospective clinical study conducted at Department of Obstetrics and Gynecology, Umaid Hospital, Dr S.N. Medical College, Jodhpur, Rajasthan, India. The study population consists of 200 subjects in the elective induction group and 200 subjects in spontaneous labor group.

The inclusion criteria of the study subjects were pregnant women with singleton live fetus with cephalic presentation, gestational age of 39weeks and above up to 41weeks, no medical contraindication for induction of labor, and willingness to participate in the study. Exclusion criteria being non-cephalic presentation, intrauterine growth restriction, oligohydramnios, polyhydramnios, pre-eclampsia, gestational diabetes mellitus, fetal congenital anomaly, placenta praevia, abruptio placenta, contracted pelvis or cephalo pelvic disproportion, pregnancy with previous LSCS.

A written informed consent was obtained from each subject participating in the study.

For the purpose of the study subjects were divided into two groups, elective induction group and spontaneous labor group. They were matched for maternal age, parity and gestational age. Those who matched with the inclusion criteria were induced with either oxytocin, prostaglandins or

by artificial rupture of membranes or combination of these and they constitute the electively induced group. Spontaneous labor is labor in the absence of pharmacologic or mechanical initiation. Duration of first and second stage of labor, mode of delivery, if caesarean section, indication for caesarean section, maternal age, birth weight was analyzed. Maternal intrapartum and post-partum complications and fetal outcome were also analyzed in both the groups

Statistical Analysis

The obtained data was analyzed, coded and entered. The data was statistically analyzed using tests like Chi-square test and unpaired t test.

3. Results

In this study, a total of 400 patients were enrolled, which included 200 patients in the induction group (study group) and 200 patients in the spontaneous labor group (control group).

Women in the spontaneous group had a mean age of 26.22 years and in the induced group had a mean age of 25.86 years. This was statistically non-significant with a p value of 0.883 and hence was comparable.

Table 1: Age distribution

	Group	N	Mean	Std. deviation	P value
Age	Induced	200	25.86 years	3.86	0.883
	Spontaneous	200	26.22 years	3.72	

Comparison of the period of gestation (POG) in days between the two groups shows that POG (days) is higher in induced group with a mean value of 281.78 days than in spontaneous group where meanPOG is 275.66 days. This is statistically significant with a p value of <0.001.

Table 2: Period of Gestation distribution

	Group	N	Mean	Std. deviation	P value
POG (days)	Induced	200	281.78 days (40wk+2d)	4.314	<0.001
	Spontaneous	200	275.66 days (39wk+3d)	7.955	

There was significant difference between the parity distributions in both the groups, with a p value of 0.015. Most women in the induced group were primigravida comprising 64% and multigravida comprising 36%. Primigravida in the spontaneous group comprised 52% and multigravida 48%.

Table 3: Parity distribution

Parity		Group		Total	
		Induced	Spontaneous		
Parity	Primigravida	Count	128	104	232
		% within group	64%	52%	58%
	Multigravida	Count	72	96	168
		% within group	36%	48%	42%
Total	Count	200	200	400	

In the present study, the comparison of duration of first stage of labor among the primigravida between the induced and spontaneous group shows higher duration in spontaneous group. This was statistically non-significant with a p value of 0.629. Comparison of the duration of second stage (mins) between the two groups shows that duration of second stage (mins) is higher in spontaneous group and is statistically significant with a p value of 0.036. Similarly, among the multigravida the comparison of duration of first stage of labor between the induced and spontaneous group showed higher duration in spontaneous group. This was statistically non-significant with a p value of 0.326. Comparison of the duration of second stage (mins) between the two groups shows that duration of second stage (mins) is higher in induced group and is statistically non significant with a p value of 0.046.

Table 4: Duration of first and second stage of labor

		Group	Mean	Std. Deviation	P value
		Spontaneous	6.84	2.59	
	Duration of second stage (mins)	Induced	22.10	14.87	0.036
		Spontaneous	26.40	16.80	
Multigravida	Duration of first stage (hrs)	Induced	4.76	1.62	0.326
		Spontaneous	5.10	2.72	
	Duration of second stage (mins)	Induced	18.26	12.24	0.046
		Spontaneous	16.20	10.27	

In the present study, the induction group is associated with increase in cesarean section rates of upto 35.5% when compared to that of spontaneous group which is 18.5%. This is statistically significant with a p value of <0.001 while the spontaneous group is associated with increased vaginal delivery rate upto 81.5% as compared to that of the induced group which is 64.5%.

Table 5: Comparison of the mode of delivery between the group

Mode of delivery	Mode of delivery	Group		Total	
		Induced	Spontaneous		
Mode of delivery	Vaginal	Count	129	163	292
		% within group	64.5%	81.5%	73%
	Cesarean section	Count	71	37	108
		% within group	35.5%	18.5%	27%
Total	Count	200	200	400	

In this present study, the birth weight of most of the babies who delivered was between 3.1-3.5 kg(42.75%). Only 40 out of 400 babies were >3.5kg. The risk of cesarean among the fetus with >3.5kg birth weight is 47.5%. This is statistically significant with a p value of 0.033.

Table 6: Birth weight of the fetus and its relation to mode of delivery

Mode of delivery		Birth weight(Kg)				Total
		2-2.5kg	2.6-3 kg	3.1-.3.5 kg	>3.5 kg	
Vaginal	Count	24	125	122	21	292
	% within group	80%	78.61%	71.34%	52.5%	73%
	Cesarean section	Count	6	34	49	19
	% within group	20%	21.38%	28.65%	47.5%	27%
Total	Count	30	159	171	36	400

In this study the most common indication for cesarean section among the induced group is failed induction (57.74%) followed by fetal distress (18.30%) and then secondary arrest of dilatation (11.26%). Among the spontaneous group the most common indication is fetal distress (56.75%) followed by arrest of descent (18.91%).

Table 7: Indication for cesarean section

Indication for cesarean section		Group	
		Induced	Spontaneous
Arrest of	Count	5	7
Descent	% Within group	7.04%	18.91%
Failed	Count	41	0
Induction	% Within group	57.74%	0.0%
Count		13	21
Fetal distress	% Within group	18.3%	56.75%
Meconium	Count	4	5
Stained liquor	% Within group	5.63%	13.51%
Secondary	Count	8	4
Arrest of dilatation	% Within group	11.26%	10.81%
Total	Count	71	37

In the present study the most common complication among the induced group is atonic PPH (n = 7). Among the spontaneous group the most common complications were atonic PPH n = 5, perineal tear n = 1 and vaginal tear n = 3. There is no statistically significant increased risk of maternal complications between the two groups, with p value 0.287. The rate of maternal complication is 5% in induced group where as it is 6% in the spontaneous group.

Table 8: Maternal complications

Maternal complications		Group	
		Induced	Spontaneous
Count		190	190
Nil	% within group	95%	95.0%
Count		47	2
Atonic PPH	% within group	3.5%	1.0%
Count		2	1
Cervical tear	% within group	1%	0.5%
Episiotomy	Count	0	1
Wound infection	% within group	0.0%	0.5%
Count		0	2
Perineal tear	% within group	0.0%	1.0%
Puerperal	Count	0	1
Sepsis	% within group	0.0%	0.5%
Count		1	2
Vaginal tear	% within group	0.5%	1.0%
Total	Count	200	200

In this study, the most common fetal complication among the induced group is hyperbilirubinemia (n=18), followed by respiratory distress (n=7). Among the spontaneous group also the common complications remain the same with hyperbilirubinemia (n = 7) and respiratory distress (n=5). Fetal complications among the induced group and spontaneous group are comparable, with a p value of 0.368. The rate of fetal complications in the induced group is 14% and in spontaneous group is 10% in this present study.

Table 9: Fetal complications

Fetal complications		Group	
		Induced	Spontaneous
Count		172	180
Nil	% within group	86.0%	90%
Count		1	0
Bradycardia	% within group	0.5%	0.0%
Count		18	14
Hyperbilirubinemia	% within group	9%	7%
Count		2	1
Meconium aspiration	% within group	1%	0.5%
Count		7	5
Respiratory distress	% within group	3.5%	2.5%

4. Discussion

According to the American College of Obstetricians and Gynecologists, "Induction of labor is undertaken when, in the opinion of the physician, the risks of delivery to the mother or the fetus or both are less than the risk of continuing the pregnancy"(2). Elective induction of labor is performed before there exists a known risk to the mother or fetus of continuing the pregnancy. Labor induction rate nationwide has gradually increased. It is evident from the fact that rate of elective induction is on the rise as the increase in medically indicated induction is less than the overall increase.

Although only limited literature is available on elective induction, its advantages and disadvantages have been described. This study evaluates the effect of elective induction of labor on the mother and fetus. The aim is not to validate or promote elective induction but to rather identify whether electively induced labor actually places the mother and her fetus at an increased risk as compared with her spontaneous labor group in low risk patients and also to determine the influence of labor induction on cesarean delivery.

In this study, both the induced and spontaneous group population are comparable by maternal age. There is a difference in the mean gestational age which is probably because the spontaneous group population going into labor before the expected date of delivery and the induced group, most of them being induced after crossing of their expected date of delivery. There was difference in the parity, with induced group comprising of more primigravida compared to multigravida.

Moreover, the risk of cesarean section is more in induced group that is 35.5% and is less in spontaneous group that is 18.5%, which is also comparable with other studies. Similar to the present study the studies done by Macer et al(3), Maslow and Sweeny et al(4), Prysak et al(5) also found an increased risk of cesarean rate in induced group.

Birth weight is an independent risk factor for the rising cesarean section rates. In the present study birth weight >3.5kg is associated with statistically significant increase in cesarean section rate of 47.5%. This is similar to the trials done by Prysak et al(5) and Seyb et al(6), who found that there is a twofold increased risk of cesarean section rate with increase in birth weight.

In the present study the duration of first and second stage of labor in spontaneous group is more than the induced group, both in primipara and multipara except for second stage in multipara. This is comparable with the study done by Macer et al(3), where similar to this study the duration of labor in first and second stage in both groups are comparable and moreover the duration first stage of labor in multipara is more in spontaneous group when compared to their counterpart induced group. The conclusion from the present study is contradicting with the study done by Vahratianet A al(7), who concluded that there is statistically significant prolongation of duration of first and second stage of labor in both primipara and multipara in the induced group. In this study there is significant difference in the duration of second stage of labor in primipara, where induced is less with a p value of 0.038.

In the present study the most common indication for cesarean section among the induced group is failed induction followed by fetal distress and then meconium stained liquor. Among the spontaneous group the most common indication is fetal distress. This result is comparable with the previous trials done by Cole et al(8), Smith et al(9) and Kato K et al(10). This can be explained by the hypothesis that fetus in stress induces labor and hence meconium can be observed in cases of spontaneous group than the induced group. However, meconium and its associated complications are less in induced group than the spontaneous group.

In the present study the maternal intrapartum complications are 5% in induced group and 5% in spontaneous group. This is comparable to the study done by Macer et al, where they found no increase in intrapartum complications with induction of labor (3).

The risk of neonatal complications was comparable between both the groups with 14% in induced group and 10% in spontaneous group. This is comparable with the studies done by Macer et al(3), Smith et al(9), Prysak et al(5). In all these studies the neonatal complications among the induced and spontaneous group were comparable and hence indicating that elective induction per se does not pose any harm to fetus. The most common complication in the induced group as well as in spontaneous group was hyperbilirubinemia.

5. Conclusion

From the present study we have concluded that elective induction of labor at term increases the risk for cesarean section. However, elective induction of labor was not associated with prolongation of duration of labor, both first stage and second stage in primipara and multipara. In fact, the duration of second stage in primipara was significantly less than the spontaneous group. There is no significant difference in the maternal complications, neonatal complications and NICU admissions in both the groups. In this study maternal complication rate was less among the induced group than the spontaneous group. Neonates among the induced group mostly had hyperbilirubinemia. Since most of the women are employed now and hence elective induction done for the convenience of the physician and

patient, the women undergoing elective induction should be informed about this before they undergo the same.

References

- [1] Management C, For G. PRACTICE BULLETIN CLINICAL MANAGEMENT GUIDELINES FOR OBSTETRICIAN – GYNECOLOGISTS Induction of Labor OBSTETRICIANS AND. 2009;114(107):386–97.
- [2] ACOG Practice Bulletin Induction of Labor VOL. 114, NO. 2, PART 1, AUGUST 2009
- [3] Macer JA, Macer CL, Chan LS. Elective induction versus spontaneous labor: A retrospective study of complications and outcome. *Am J Obstet Gynecol* [Internet]. 1990;166(6):1690–7. Available from: [http://dx.doi.org/10.1016/0002-9378\(92\)91558-R](http://dx.doi.org/10.1016/0002-9378(92)91558-R)
- [4] Maslow AS, Sweeny AMYL. Elective Induction of Labor as a Risk Factor for Cesarean Delivery Among Low-Risk Women at Term. 2000; 95(6):917–22.
- [5] Prysak M, Castronova FC. Elective Induction Versus Spontaneous Labor: A Case-Control Analysis of Safety and Efficacy. 1998; 92(1):47–52.
- [6] Seyb ST, Berka RJ, Socol ML, Dooley SL. Risk of Cesarean Delivery with Elective Induction of labor at term in nulliparous women. *Obstet Gynecol*. 1999; 94:600-7.
- [7] Hoffman MK, Vahratian A. Comparison of Labor Progression Between Induced and Noninduced Multiparous. 2006; 107(5):13–6.
- [8] Cole RA, Howie PN, Macnaughton MC. Elective induction of labor: A randomized prospective trial. *Lancet*. 1975; 1:767-70.
- [9] Smith LP, Nagourney BA. Hazards and benefits of elective induction of labor. *Am J Obstet Gynecol*. 1984;148:579-585
- [10] Kato K, Nagata I, Furuya K, Makimura N. Programmed induction of labor for primiparous women to ensure day time delivery. *Asia Oceania J Obstet Gynecol*. 1987; 13:405-15.